Angle's Classification of Malocclusion

Procedure & Method Information

Name of Procedure/Method Angle's Classification of Malocclusion

Abbreviation None

Purpose To categorize malocclusion.

Year of Establishment 1899

Type of Procedure/Method

Developer(s) E.H. Angle

Oral Condition Category

Background Information

Background Information In 1899, the Angle's Classification of Malocclusion was developed by E.H. Angle, a very influential and innovative contributor to the field of orthodontics. It was the first simple and logical classification system for malocclusion and is still used as the basis for orthodontic diagnosis (Travers, 1994). It is considered to be useful for treatment planning but not for epidemiological surveys due to its nominal categorization (Burt and Eklund, 1999).

Changes Over Time None

Procedure Method

Procedure Method

Angle's Classification of Malocclusion

Class I
Relative position of the dental arches, mesio-distally, normal, with malocclusions usually confined to the anterior teeth. First molars usually in normal occlusion, although one or more may be in lingual or buccal occlusion. Cases belonging to this class far exceed in number those of all other classes combined.

Class II
Retrusion of the lower jaw, with distal occlusion of the lower teeth.

Division I

a. Narrow upper arch, with lengthened and prominent upper incisors; lack of nasal and lip function.
Mouth-breathers.

b. Same as a., but with only one lateral half of the arch involved, the other being normal. Mouth-breathers.

Division II

a. Slight narrowing of the upper arch; bunching of the upper incisors, with overlapping and lingual
inclinations; normal lip and nasal function.

b. Same as a., but with only one lateral half of the arch involved, the other being normal; normal lip and
mouth function.

Class III

a. Protrusion of the lower jaw, with mesial occlusion of the lower teeth; lower incisors and cuspids inclined
lingually.

b. Same as a., but with only one lateral half of the arch involved, the other being normal.

Source: Angle EH. Classification of malocclusion. Dent Cosmos 1899;41:248-64.

Established Modifications None

Federal Survey Modifications None

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Association of State and Territorial Dental Directors' Screening Survey Protocol

Procedure & Method Information

Name of Procedure/Method Association of State and Territorial Dental Directors' Screening Survey Protocol

Abbreviation None

Purpose To screen dentition for specific dental conditions (e.g., untreated cavities, early childhood caries, dental sealants, or edentulousness) according to age group.

Year of Establishment 1999

Type of Procedure/Method

Developer(s) Association of State and Territorial Dental Directors

Oral Condition Category

Background Information

Background Information

The Association of State and Territorial Dental Directors (ASTDD), established in 1947, is a national nonprofit organization that represents the directors and staff of state public health agency programs for oral health. The ASTDD's mission is to formulate and promote the establishment of national dental public health policy and to assist the state dental health programs in the development and implementation of programs and policies for the prevention of oral health diseases (ASTDD, 2001).

In accordance with its mission, the ASTDD developed a protocol or a set of guidelines for its Screening Training Project (STP) that could be utilized by screeners with or without a dental health background to conduct screening surveys. These guidelines were formulated because nondental health professionals, such as public health nurses, sometimes have direct access to some population groups and because some states and communities have few public health dental professionals to assist in screening surveys (ASTDD, 1999). Although the ASTDD is a national level organization, no state or community is required to adopt the screening survey protocol recommendations (ASTDD, 1999).

The ASTDD developed three separate protocols for implementing screening surveys based on age, the first for preschool children, the second for school children, and the third for adults. All protocols have indicators for assessing the presence of cavities and the urgency need for dental care; however, there are some differences for each protocol. For example, the preschool children protocol evaluates caries experience and early childhood caries for children through age 3; the school children protocol assesses caries experience and the presence of dental sealants; and the adult protocol determines whether the subject is edentulous or not.

Changes Over Time None

Procedure Method

Procedure Method

When conducting the ASTDD protocol for a screening survey, it is strongly recommended that not only natural and/or overhead lighting be used but other lighting sources such as a flashlight or penlight, a portable dental light, a nondental exam light, or head lamp. Other recommendations include the use of tongue blades or dental mirrors (i.e., disposable mirrors, steel-handed/reusable sterilizable mirrors, or fiberglass/reusable sterilizable mirrors) for retraction and visualization. It is also advised that gloves be worn throughout the procedure in the event the screener inadvertently comes into contact with the subject's saliva or mouth. If there is no physical contact between screening subjects, it is not necessary for the screener to change gloves. However, if there is any physical contact with the subject's mouth, lips, or saliva, the gloves must be removed and the hands must be washed or rubbed with an antiseptic handwash before putting on a new pair of gloves to screen the next individual.

Prior to the screening, the subject's teeth should be cleaned with a toothbrush to remove food debris. An explorer, toothpick, or wooden end of a cotton-tipped applicator may be used to dislodge debris. If the teeth are too wet to observe the tooth surfaces, a long-handled cotton-tipped applicator, a cotton roll, or gauze square may be used to absorb the excess saliva. Although dental explorers (i.e., disposable explorers and steel-handled/reusable sterilizable explorers) or probes are not standard equipment for this procedure, they may be used and limited to dentists or dental hygienists for primarily feeling the fissured surfaces to determine the presence of sealants. Dental explorers may be used with very light pressure to feel for the discontinuity of the enamel surface, but they should not be used to determine a "stick" or tugback for a suspected carious lesion (ASTDD, 1999).

For the ASTDD screening survey protocol, the screener assesses the indicators (i.e., untreated cavities, caries experience, early childhood caries, sealants on permanent molars, and the presence of natural teeth) outlined below according to the subject's age group and records whether each condition is present (code = 1) or not present (code = 0). If there is doubt about whether a condition is present, it is advised by the ASTDD to be conservative and assume the conditon is not present (i.e., code 0).

Then, for the indicator, Urgency of Need for Dental Care, the screener records whether the subject requires urgent/emergency need for dental care (code = 2), early need for dental care (code = 1), or no obvious problems/routine dental care (code = 0). Only one code should be assigned per subject for each of the screening indicators.

ASTDD Reference Guide for Screening Surveys: Preschool Children

Indicator #1: Cavities
Indicator #2: Caries Experience (children who have ever had a cavity)
Indicator #3: Early Childhood Caries (children through age 3)
Indicator #4: Urgency of Need for Dental Care

ASTDD Reference Guide for Screening Surveys: School Children

Indicator #1: Cavities
Indicator #2: Caries Experience (children who have ever had a cavity)
Indicator #3: Dental Sealants
Indicator #4: Urgency of Need for Dental Care

ASTDD Reference Guide for Screening Surveys: Adults

Indicator #1: Cavities
Indicator #2: Natural Teeth
Indicator #3: Urgency of Need for Dental Care

Source: Association of State and Territorial Dental Directors. Basic screening surveys: an approach to monitoring community oral health. Columbus: Ohio Department of Health, 1999.

ASTDD Indicator Criteria and Coding

Cavities

Criteria: At least one permanent or primary tooth with BOTH a loss of at least 1/2 mm of tooth structure at the enamel surface (cavitation) AND brown to dark-brown coloration of the walls of the cavity, even if a filling or a crown is also present. The criteria apply to both pit and fissure cavities as well as those on smooth tooth surfaces. Broken or chipped teeth are considered sound unless a cavity is found. If the screener notices a retained root, assume that the whole tooth was destroyed by caries and code the individual as having a cavity (i.e., code 1).

Sound tooth (code = 0)
Stained groove, no cavitation (code = 0)
White spot, no cavitation (code = 0)
Threshold cavity (code = 1)

Caries Experience (children who have ever had a cavity)

Criteria: At least one untreated cavity, a filling, or missing permanent molar. If a child is found to have at least one decayed tooth, code as "1." If there are no cavities, look for fillings, crowns, and missing permanent molars.

Amalgam filling (code = 1)
Tooth-colored filling (code = 1)
Temporary filling (code = 1)

Note: A crowned front tooth in an adolescent may be the result of injury rather than caries. Therefore, you should question the adolescent about his or her recollection of injury and code the child accordingly.

Early Childhood Caries

Criteria: Any child age 3 or under with at least one of the upper front teeth either decayed, filled, or missing due to caries.

Early childhood caries (code = 1)

Note: Missing front teeth in this age group are most likely due to caries or to traumatic injuries. Therefore, the cause of missing front teeth must be identified by questioning the parent or guardian, if present, or including a question on the consent form.

Dental Sealants

Criteria: Any amount of sealant that is detected on a permanent molar only.

Clear sealant (code = 1)
Partially retained sealant (code = 1)

Natural Teeth

Criteria: Adults who have one or more of their own teeth (code = 1). Full dentures (code = 0). Do not confuse dentures with natural teeth. You may want to ask adults, either in person or on a questionnaire, if they have false teeth.

Urgency of Need for Dental Care

Urgent/Emergency Need for Dental Care (code = 2)

Next dental visit: Within 24 hours
Criteria: Pain; infection; swelling; or soft tissue ulceration of more than 2 weeks' duration.

Early Need for Dental Care (code = 1)

Next dental visit: Within several weeks
Criteria: Caries without accompanying signs or symptoms; individuals with spontaneous bleeding gums; suspicious white or red soft tissue areas; or ill-fitting dentures.

No Obvious Problems/Routine Dental Care (code = 0)

Next dental visit: Next regular checkup
Criteria: Any subject without problems listed for codes 1 and 2.

Note: If it is felt that an individual needs to see a dentist sooner or later than the initial code recommends, the
treatment urgency code may be overridden.

Source: Association of State and Territorial Dental Directors. Basic screening surveys: an approach to monitoring community oral health. Columbus: Ohio Department of Health, 1999.

In addition to the clinical procedures above, the screening survey protocol may also accompany a questionnaire on access to care. The access to care questions may be included on the consent form for the parent or the guardian of the child or asked directly for adults. The questions recommended by the ASTDD regarding access to care are:

Recommended Questions

1. During the past 6 months, did {you/your child} have a toothache more than once, when biting or chewing?
[Source: National Health Interview Survey (NHIS), 1989]

1. Yes
2. No
3. Don't know/don't remember

2. About how long has it been since {you/your child} last visited a dentist? Include all types of dentists, such as,
orthodontists, oral surgeons, and all other dental specialists, as well as dental hygienists. [Source: NHIS, 1997]

1. 6 months or less
2. More than 6 months, but not more than 1 year ago
3. More than 1 year ago, but not more than 3 years ago
4. More than 3 years ago
5. Never have been
6. Don't know/don't remember

3. What was the main reason that {you/your child} last visited a dentist? (Please check one) [Source: NHIS, 1986]

1. Went in on own for checkup, examination, or cleaning.
2. Was called in by the dentist for checkup, examination, or cleaning.
3. Something was wrong, bothering, or hurting.
4. Went for treatment of a condition that dentist discovered at earlier checkup or examination.
5. Other
6. Don't know/don't remember

4. During the past 12 months, was there a time when {you/your child} needed dental care but could not get it at

that time? [Source: NHIS, 1994]

1. Yes
2. No
3. Don't know/don't remember

5. The last time {you/your child} could not get the dental care (you/he/she) needed, what was the main reason (you/he/she) couldn't get care? (Please check one) [Source: NHIS, 1994]

1. Could not afford it
2. No insurance
3. Dentist did not accept Medicaid/insurance
4. Not serious enough
5. Wait too long in clinic/office
6. Difficulty in getting appointment
7. Don't like/trust/believe in dentists
8. No dentist available
9. Didn't know where to go
10. No way to get there
11. Hours not convenient
12. Speak a different language
13. Health of another family member
14. Other reason
15. Don't know/don't remember

6. Do you have any kind of insurance that pays for some or all of {your/your child's} MEDICAL or SURGICAL CARE? Include health insurance obtained through employment or purchased directly as well as government programs like Medicaid.

1. Yes
2. No
3. Don't know/don't remember

7. Do you have any kind of insurance that pays for some or all of {your/your child's} DENTAL CARE? Include health insurance obtained through employment or purchased directly as well as government programs like Medicaid.

1. Yes
2. No
3. Don't know/don't remember

Additional questions for survey planners to consider:

8. During the past 12 months, was there a time when you felt that {you/your child} needed

MEDICAL CARE OR
SURGERY but could not get it at that time? [Source: Modified from NHIS, 1994]

1. Yes
2. No
3. Don't know/don't remember

9. The last time {you/your child} could not get the MEDICAL CARE OR SURGERY (you/he/she) needed, what was the main reason (you/he/she) couldn't get care? [Source: NHIS, 1994]

1. Could not afford it
2. No insurance
3. Doctor did not accept Medicaid/insurance
4. Not serious enough
5. Wait too long in clinic/office
6. Difficulty in getting appointment
7. Don't like/trust/believe in dentists
8. No doctor available
9. Didn't know where to go
10. No way to get there
11. Hours not convenient
12. Speak a different language
13. Health of another family member
14. Other reason
15. Don't know/don't remember

For all questions, Refused/no response is a coding option but it is not listed as a choice on the questionnaire. For one-digit variables, 9 is coded; for two-digit variables, the Refused/no response code is 99.

Source: Association of State and Territorial Dental Directors. Basic screening surveys: an approach to monitoring community oral health. Columbus: Ohio Department of Health, 1999.

Established Modifications None

Federal Survey Modifications None

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Validaty

Reliability

Listing of Publications with Surveys &

Surveys & Studies

Community Peridontal Index of Treatment Needs

Procedure & Method Information

Name of Procedure/Method Community Peridontal Index of Treatment Needs

Abbreviation CPITN or CPI

Purpose To assess periodontal treatment needs.

Year of Establishment 1982

Type of Procedure/Method

Developer(s) World Health Organization (WHO)

Oral Condition Category

Background Information

Background Information

In 1982, the Community Periodontal Index of Treatment Needs (CPITN) was developed under the initiative of the World Health Organization (WHO) primarily to survey and evaluate periodontal treatment needs rather than determining past and present periodontal status, i.e., the recession of the gingival margin and alveolar bone (Ainamo, Barmes, Beagrie, Cutress, Martin, and Sardo-Infirri, 1982). The CPITN is an evolution of the "621" method, named for the WHO technical report series publication number in which this method was first featured (Burt and Eklund, 1999).

The "621" method evaluated periodontal disease and treatment needs by examining the six Ramfjord teeth among four different age groups, (i.e., 15-19, 20-29, 30-44, and 45-64 years) for the presence or absence of supra- and subgingival calculus, shallow (i.e., 4-5 mm) and deep (i.e., 6 mm or more) pocket depths, and gingival bleeding after probing.

In comparison, the CPITN evaluates the presence or absence of supra- and subgingival calculus, shallow (i.e., 4-5 mm) and deep (i.e., 6 mm or more) pocket depths, and gingival bleeding after probing. However, the procedural method varies according to its use, whether used in epidemiological surveys or clinical practice, and the age of the individual. For epidemiological purposes, 10 specified index teeth are examined for adults aged 20 years and over, and 6 specified index teeth are examined for persons aged 19 and under. These index teeth were selected since they have been determined to be the best estimators of the worst periodontal condition of the mouth (Cutress, Ainamo, and Sardo-Infirri, 1987). For clinical practice, all teeth are examined for adults aged 20 years and over.

Whether in epidemiological surveys or clinical practice, for age groups 19 years and under, full mouth examinations (i.e., full sextant recordings) have demonstrated little advantage over partial recordings or index teeth (Ainamo, Barmes, Beagrie, Cutress, Martin, and Sardo-Infirri, 1982). For children under 15 years of age, only gingival bleeding and calculus are evaluated. Periodontal pockets are not examined.

The CPITN is one of the most widely used and recognized indices. A number of national dental associations encourage its use among their memberships, and the U.S. Indian Health Service used to use the CPITN in its treatment plan before the American Dental Association's promotion of a slightly modified version, the Periodontal Screening and Recording (PSR) (Burt and Eklund, 1999). This widespread use has contributed substantially to WHO's Global Oral Data Bank.

This worldwide use is also due to the fact that the CPITN is thought to be a rapid, simple, reliable, and valid measure of treatment need (Ainamo, Barmes, Beagrie, Cutress, Martin, and Sardo-Infirri, 1982; Cutress, Ainamo, and Sardo-Infirri, 1987; Gilbert, 1994). However, according to literature, the validity of the CPITN is debatable. In several studies, it has demonstrated good validity (Cutress, Ainamo, and Sardo-Infirri, 1987). While in others, it has underestimated in some areas and overestimated others (Burt and Eklund, 1999).

Changes Over Time

When the CPITN was first described, there was no specific rule for the number of times a tooth should be probed for the examination procedure. It is only stated that the number of probings would depend on the condition of the surrounding tissue and that exceeding four probings per sextant would be rare (Ainamo et al., 1982). However, according to later literature, a tooth should be probed in at least six points, the mesio-buccal, mid-buccal, disto-buccal, and the corresponding sites on the lingual surface (Cutress, Ainamo, and Sardo-Infirri, 1987; WHO, 1987). Also, when first described, it was stated that the probing force should be no more than 25 grams. Now, the probing force should be no more than 20 grams. Furthermore, there was initially no differentiation with the procedural method based on age.

The CPITN used to assign examined individuals or populations into four treatment recommendation categories based on the worst clinical finding. However, since approaches to treatment have changed since the CPITN was first described, these treatment recommendation categories are no longer used (WHO, 1997; Burt and Eklund, 1999). Hence, the name change from Community Periodontal Index of Treatment Needs (CPITN) to Community Periodontal Index (CPI) (WHO, 1997). Currently, data are arranged in categories according to the clinical findings per sextant. For more information on the treatment recommendation categories, please refer to the procedural method for the CPITN.

Procedure Method

Procedure Method

The CPITN is not a diagnostic measure of periodontitis but a measure of treatment need. Therefore, it should not be used in the planning of specific clinical treatment for individual patients (Cutress, Ainamo, and Sardo-Infirri, 1987). The CPITN is a screening procedure for identifying actual and potential problems posed by conditions associated with periodontal disease.

To obtain the CPITN, the mouth is first divided into sextants denoted by the Federation Dentaire Internationale (FDI) dental notation, 18-14, 13-23, 24-28, 38-34, 33-43, and 44-48.

Then, it is determined if the sextant qualifies for scoring. A sextant qualifies for scoring only if there are two or more teeth present and not indicated for extraction (i.e., more than one functioning tooth present per sextant). An indication of extraction for periodontal involvement is that the tooth has vertical mobility and causes discomfort to the patient (Ainamo, Barmes, Beagrie, Cutress, Martin, and Sardo-Infirri, 1982). When there is only one functioning tooth present in a sextant, this tooth, unless an index tooth, should be included in the adjacent sextant and subject to its procedural rules. When a sextant does not qualify for examination and/or scoring, the missing sextant is indicated with a diagonal line or X; then the next sextant is examined. Periodontal treatment needs are recorded for each sextant, resulting in a maximum of six recordings.

The CPITN has a special probe constructed for two purposes, measurement of pocket depth and detection of subgingival calculus. This probe has a thin handle and is very light in weight. In addition, it has a 0.5 mm diameter ball tip to facilitate the detection of subgingival calculus and a black color marking band between 3.5 mm and 5.5 mm for easy visibility. A variant of the basic probe has circular markings at 8.5 mm to 11.5 mm. These probes are referred to as the CPITN-E for epidemiological probe with the 3.5 and 5.5 mm marking and the CPITN-C for clinical probe with the additional 8.5 and 11.5 mm circular markings.

For the exam procedure, the tooth is probed with a force of no more than 20 grams, described as a force in which a probe point can be inserted under the fingernail without causing pain or discomfort, to determine pocket depth. When gently inserting the probe into the gingival pocket, the ball tip should follow the anatomic configuration of the tooth root surface. As stated earlier, the total extent of the pocket should be examined in at least six points on each tooth, the mesio-buccal, mid-buccal, disto-buccal, and the corresponding lingual sites. For detecting subgingival calculus, the lightest possible force should be used to allow movement of the probe's ball tip along the tooth surface. If the subject feels pain during the probing procedure, this is an indication of too much force. The probing may be done by withdrawing the probe between each probing or by the probe tip remaining in the sulcus or pocket in order to walk the probe around each surface (i.e., buccal and lingual) of the tooth (Cutress, Ainamo, and Sardo-Infirri, 1987). "Walking" the probe should be done with short upward and downward movements.

After probing, the gingiva or gum of the examined tooth should be inspected for the presence or absence of bleeding before the subject is allowed to swallow or close their mouth. Bleeding may be delayed for up to 10 to 30 seconds after probing.

The procedural method depends on the age of the examined individual and whether the procedure is being used for epidemiologic surveys or clinical practice. For the CPITN, third molars are not examined, except when they function as a substitution for missing or excluded teeth. In this case, the distal surfaces are not examined/scored.

For epidemiological purposes, CPITN utilizes specific index teeth for the examination procedure. Although index teeth are examined, again, only a maximum of six recordings are made, one representing each sextant.

In the posterior sextants, the index molars are paired. So, when one or both of the index molars are present, the worst finding from these tooth surfaces is recorded for the designated sextant. If one of the two index molars is missing or excluded, then the scoring is based on the remaining index molar. In this case, there are no replacements or substitutions. However, when there is no index tooth or teeth qualifying for examination present in a posterior sextant, all the remaining teeth in that sextant are examined, and the scoring is based on the worst finding. In the anterior sextants, if the index central or #11 is excluded, then #21 is substituted. If #21 is excluded, then the remaining teeth are examined and the highest score for this sextant is recorded. Likewise, for the index central (i.e., #31) in the lower arch, #41 is substituted. According to WHO, the scoring or recording of codes for the six index teeth should not exceed 1 to 2 minutes (Ainamo, Barmes, Beagrie, Cutress, Martin, and Sardo-Infirri, 1982).

Whenever feasible, it is recommended that the findings in every tenth or twentieth subject be recorded for the index teeth and for the worst finding per sextant, so the results for the partial examination (i.e., index teeth) can be compared for analysis of reliability (Ainamo, Barmes, Beagrie, Cutress, Martin, and Sardo-Infirri, 1982).

For adults aged 20 years and over, ten specified index teeth are examined. They are:

17	16	11	26	27
47	46	31	36	37

That is, the right maxillary second molar (17), the right maxillary first molar (16), the right maxillary central incisor (11), the left maxillary first molar (26), the left maxillary second molar (27), the left mandibular second molar (37), the left mandibular first molar (36), the left mandibular central incisor (31), the right mandibular first molar (46), and the right mandibular second molar (47).

For ages under 20 years, only six index teeth are examined. Second molars are not examined to avoid the risk of classifying deepened crevices associated with eruption as periodontal pockets (WHO, 1987). For the same reason, when examining children under the age of 15, only probing for bleeding and calculus are conducted. There is no recording of pocket depth. In cases where the first molar is missing or excluded, the nearest adjacent premolar is substituted. The six index teeth are:

16	11	26
46	31	36

For use in a clinical setting, all teeth are examined per sextant and the CPITN recording is based on the worst finding from all teeth in that sextant. This method is also suitable for adult populations with a history of high caries prevalence and extensive restorative treatment (Ainamo, Barmes, Beagrie, Cutress, Martin, and Sardo-Infirri, 1982). In contrast, research states that full mouth examination based on sextant has little advantage over partial examination of the index teeth for age groups up to 20 years (Ainamo, Barmes, Beagrie, Cutress, Martin, and Sardo-Infirri, 1982).

The CPITN clinical findings are recorded for each sextant, resulting in a maximum of six recordings. These findings for the examined teeth are based on the following codes and criteria, and from those findings the subject is assigned into one of the four following treatment need category groups based on the most severe score or finding identified in their mouth. See Treatment Recommendation chart below. According to recent literature, these treatment recommendation categories are no longer used since approaches to treatment have changed since the CPITN was first described (WHO, 1997; Burt and Eklund, 1999).

For the CPITN, data are arranged in categories and reported as the number or percentage of subjects in a category instead of calculating mean values. In addition, it is also beneficial to report the mean number of sextants affected per subject and with bleeding, calculus, moderate pockets, or deep pockets for each age group (Ainamo, Barmes, Beagrie, Cutress, Martin, and Sardo-Infirri, 1982).

The Community Periodontal Index of Treatment Needs (CPITN) Codes and Criteria

0: Healthy gingiva.
1: Bleeding observed, directly or by using the mouth mirror, after "sensing" (i.e., gentle probing).
2: Calculus felt during probing but all the black area of the probe visible (3.5 - 5.5 mm from ball tip).
3: Pocket 4 or 5 mm (gingival margin situated on black area of probe, i.e., 3.5 - 5.5 mm from probe tip).
4: Pocket > 6 mm (black area of probe not visible).
X: Excluded segment (fewer than two teeth present).
9: Not recorded.

Source: World Health Organization. Oral Health Surveys: Basic Methods, 4th edition. Geneva: WHO, 1997.

Treatment Recommendation for the Community Periodontal Index of Treatment Needs (CPITN)

Maximum score 0: No need for additional treatment.
Maximum score 1: Need to improve personal oral hygiene.
Maximum score 2: Need for professional cleaning of teeth, plus improvement in personal oral hygiene.
Maximum score 3: Need for professional cleaning of teeth, plus improvement in personal oral hygiene.
Maximum score 4: Need for more complex treatment to remove infected tissue.

Source: Svirbely JR, Sriram MG. The Medical Alogrithms Project. Retrieved September 14, 1999, from the World Wide Web: http://www.medal.org/index.html.

Established Modifications

Besides the slight changes to the CPITN since it was first described, there have been very few changes to the index for epidemiological and public health purposes. However, there have been several versions developed that modify the CPITN for the monitoring and screening of individuals in a clinical setting or practice. These modifications include the Simplified Periodontal Examination (SPE), later termed the Basic Periodontal Examination (BPE), and the Periodontal Screening and Recording (PSR).

The PSR that has attachment loss incorporated into its procedural method is predominantly used in the United States and Canada and is promoted by the American Academy of Periodontology and the American Dental Association.

Federal Survey Modifications

None

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Coronal & Root Caries Procedures in the National Institute of Dental Research (NIDR) Surveys and the Health and Nutrition Examination Surveys (HANES)

Procedure & Method Information

Name of Procedure/Method Coronal & Root Caries Procedures in the National Institute of Dental Research (NIDR) Surveys and the Health and Nutrition Examination Surveys (HANES)

Abbreviation N/A

Purpose To assess the prevalence of coronal and root caries (i.e., cavities).

Year of Establishment N/A

Type of Procedure/Method

Developer(s) National Institute of Dental and Craniofacial Research (NIDCR) and the National Center for Health Statistics (NCHS), United States

Oral Condition Category

Background Information

Background Information

Coronal caries procedures have been done for all of the National Institute of Dental Research (NIDR) surveys (i.e., NIDR National Dental Caries Prevalence Survey, 1979-1980, NIDR National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-1986, NIDR National Survey of Oral Health in U.S. School Children, 1986-1987) and the Health and Nutrition Examination Surveys (i.e., National Health and Nutrition Examination Survey (NHANES) I, 1970-1974, Hispanic Health and Nutrition Examination Survey (HHANES), NHANES III, 1988-1994, NHANES IV, 1998-2004). These coronal caries procedures were predominantly done by the Decayed, Missing or Filled (DMF) Index or slight modifications of the DMF Index. For more information on coronal caries procedures, please refer to the Decayed, Missing, or Filled Permanent Teeth (DMFT) Index and the Decayed, Missing, or Filled Permanent Tooth Surfaces (DMFS) Index.

Root caries procedures were carried out by the principles of the Decayed and Filled Permanent Root Surfaces (DFS) Index and were only done in a few surveys including the NIDR National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-1986, the NHANES III, 1988-1994, and the NHANES IV, 1998-2004.

Root caries are primarily observed among adult and elderly populations and occur where there has been an apical recession of the normal gingival attachment from the cemento-enamel junction (CEJ). However, approximately 15 percent of all root surface lesions have occurred on surfaces with no gingival recession, although loss of periodontal attachment was present (Burt and Eklund, 1999).

These lesions tend to begin at or just below the CEJ and seldom spread apically; however, since new root carious lesions commonly develop at or near the present gingival margin, these new lesions may appear further down the root of the tooth if gingival recession continues. Even though root caries seldom spread apically, they may spread laterally, producing a gutter or collar effect with adjacent lesions. It is also thought that root caries commonly occur proximally and buccally on the tooth (NIDR National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-1986; NHANES III, 1988-1994; NHANES IV, 1998-2004).

Initial and active root caries lesions are usually small and round in size and a yellowish orange, tan, or light brown color, respectively; while later lesions are usually darker, sometimes almost black.

Changes Over Time N/A

Procedure Method

Procedure Method

Coronal procedures were done by the Decayed, Missing or Filled (DMF) Index with slight modifications, so please refer to the "Federal Survey Modifications"section under the "Procedure Method" tab for the Decayed, Missing or Filled Permanent Teeth (DMFT) Index and the Decayed, Missing, or Filled Permanent Tooth Surfaces (DMFS) Index.

For the root caries procedures, the sequence of the examination is identical to the exam for coronal caries (i.e., DMFS). All exposed portions of each tooth's root surface (i.e., four root surfaces: lingual, labial/buccal, mesial, and distal, irrespective of the number of roots) are examined carefully with a surface reflecting mirror and No. 23 explorer and coded following the same sequence as shown on the data forms. The most difficult areas to examine are approximal surfaces in the posterior teeth, particularly those that contain restorations. Third molars are not evaluated and subgingival inspection is not recommended since few lesions are confined subgingivally and it may produce bleeding.

In all previously mentioned surveys, forms are arranged by quadrant. In the NIDR National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-1986 and NHANES III, 1988-1994, the examiner started with the upper left central incisor and continued distally through to the second molar in the same quadrant. The same sequence was followed for the upper right, lower left, and lower right quadrants, in that order. The examiner also examined each individual tooth in the following order: lingual, labial/buccal, mesial, and distal. However, in NHANES IV, the examination sequence changed. The examination started in the upper right quadrant with the right central incisor and continued to the upper left, lower left, and lower right quadrants. Each quadrant was dried prior to its examination. In addition, in NHANES IV, individual tooth surfaces were not recorded. A "whole mouth" call was made for the presence of root caries.

The diagnostic codes for the root caries procedures in each Federal survey are as follows:

NIDR National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-1986

Tooth Status Call Codes

S = Sound Crown (no caries or restorations)
R = Sound Root (no caries or restorations)
C = Full Crown Coverage
U = Unerupted
E = Missing (caries/periodontal diseases)
M = Missing (orthodontic or non-disease)
Y = Exclusion (tooth, root cannot be scored)

Surface Status Call Codes

Caries
X = Occlusal Surface
0 = Lingual Surface
1 = Buccal Surface
2 = Mesial Surface
3 = Distal Surface

Restorations
5 = Occlusal Surface
6 = Lingual Surface
7 = Buccal Surface
8 = Mesial Surface
9 = Distal Surface

Recurrent Caries
55 = Occlusal Surface
66 = Lingual Surface
77 = Buccal Surface
88 = Mesial Surface
99 = Distal Surface

Note: There is no occlusal code, i.e., X, 5, or 55, for root surfaces or for the crowns of anterior teeth.

Source: National Institutes of Health, National Institute of Dental Research. The National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-1986. Washington, DC: U.S. Government Printing Office.

National Health and Nutrition Examination Survey (NHANES) III, 1988-1994

Tooth Status Call Codes

R = Sound Root (no caries or restorations)
R = Full Crown Coverage (extending on to root surface with no recurrent decay)
M = Unerupted
M = Missing (caries/periodontal diseases)
M = Missing (orthodontic or non-disease)
Y = Exclusion (tooth or root cannot be scored)

Surface Status Call Codes

Caries
0 = Lingual Surface
1 = Buccal Surface
2 = Mesial Surface
3 = Distal Surface

Restorations
6 = Lingual Surface
7 = Buccal Surface
8 = Mesial Surface
9 = Distal Surface

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey III, 1988-1994. Washington, DC: U.S. Government Printing Office.

National Health and Nutrition Examination Survey (NHANES) IV, 1998-2004

"Whole Mouth" Status Call Codes

1 = Root caries detected
2 = No root caries detected
9 = Cannot be assessed

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.

Among the Federal surveys, several guidelines for diagnosing root caries were established to promote a consistent diagnosis. They are as follows:

1. In some early lesions, the carious area of the root surface may merely be discolored without cavitation, but the area will be soft to exploration. Cavitation with jagged margins and a roughened but soft floor or base usually occurs in advanced lesions. Normal cementum is softer than enamel and frequently will yield to pressure from the tip of an explorer. Areas of root caries, however, are softer than surrounding cementum; therefore, it is possible to differentiate sound cementum from carious cementum based on tactile sense. In the presence of root caries, an explorer penetrates the tissue but usually can be removed easily. However, if the explorer penetrates but resists withdrawal or "sticks", the surface is usually sound cementum.

2. Areas of abrasion or erosion in root surfaces rarely become carious because they are generally kept clean and are free of plaque. Root caries frequently occur beneath plaque, but rarely beneath calculus. Accumulations of plaque that obstruct the examination procedure should be removed. Surfaces covered entirely by calculus are considered sound.

3. Whenever both coronal and root surfaces are affected by a single caries lesion that extends at least 1 mm past the cemeto-enamel junction (CEJ) in both cervical-incisal and cervical-apical directions, both surfaces should be scored as decayed. However, for a lesion affecting both the crown and root surfaces that does not extend at least 1 mm, the surface on the side of the CEJ that involves more than 50% of the lesion area should be scored. When it is impossible to apply the ">50% rule", i.e., when both the coronal and root surfaces appear to be affected equally, both surfaces should be scored "decayed". For restorations, the same rules apply.

4. Because of the constricted anatomy of the root surfaces of lower incisors, few lesions will be confined solely to the lingual surface, only small lesions at the midpoint. Most lingual lesions will also affect the adjacent mesial and/or distal root surfaces. However, lesions of the mesial and distal surfaces that extend lingually but do not reach the midline are only scored as interproximal lesions.

5. On all other teeth, when root surface caries appear to wrap around the line angle of the root, the more involved surface is considered the primary site of the lesion and is scored carious, whereas the adjoining surface is only scored as carious when the lesion clearly extends at least 1 mm past the line angle.

6. Defective margins of fillings should be checked with an explorer for recurrent decay. The criterion for scoring "decayed and filled" root surfaces is the same as that for coronal surfaces, that is, decay takes precedence over a filling. Full crown coverage is considered to have been placed for coronal caries even if the margin of the crown extends onto the root surface. Thus, a root surface with a crown margin free of recurrent decay should be scored sound (e.g., code "R").

Note: Extracts from "Oral Health Surveys of the National Institute of Dental Research: Diagnostic Criteria and Procedures."

Established Modifications — See above Procedure Method.

Federal Survey Modifications — See above Procedure Method.

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Validaty

Reliability

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Dean's Fluorosis Index

Procedure & Method Information

Name of Procedure/Method Dean's Fluorosis Index

Abbreviation None

Purpose To assess the degree and prevalence of dental fluorosis.

Year of Establishment 1934

Type of Procedure/Method

Developer(s) H.T. Dean

Oral Condition Category

Background Information

Background Information

The first Fluorosis Index for categorizing dental fluorosis, created by H. Trendley Dean in 1934, was based on a 7-point ordinal scale: normal, questionable, very mild, mild, moderate, moderately severe, and severe. This original Fluorosis Index scale was used for some time. However, by 1939, Dean's knowledge and experience led him to combine the "moderately severe" and "severe" categories, resulting in the revised 1942 6-point ordinal scale that is extensively used today. It is also this version that is still recommended by the World Health Organization (WHO) in its basic survey manual (Burt and Eklund, 1999; World Health Organization, 1997).

Changes Over Time

As mentioned above, Dean's Fluorosis Index was changed from a 7-point ordinal scale to a 6-point ordinal scale in 1942 by combining the categories, "moderately severe" and "severe," into one single "severe" category. The criteria were also slightly modified and are noted below.

Dean's Fluorosis Index - Modified Criteria (Dean, 1942)

0 = Normal
The enamel represents the usual translucent semi-vitriform type of structure. The surface is smooth, glossy, and usually of a pale creamy white color.

0.5 = Questionable
The enamel discloses slight aberrations from the translucency of normal enamel, ranging from a few white flecks to occasional spots. This classification is utilized in those instances where a definite diagnosis of the mildest form of fluorosis is not warranted and a classification of "normal" not justified.

1.0 = Very Mild
Small, opaque, paper-white areas scattered irregularly over the tooth, but involving as much as approximately 25% of the tooth surface. Frequently included in this classification are teeth showing no more than about 1 to 2 mm of white opacity at the tips of the summits of the cusps of the bicuspids or second molars.

2.0 = Mild
The white opaque areas in the enamel of the teeth are more extensive, but do not involve as much as 50% of the tooth.

3.0 = Moderate
All enamel surfaces of teeth are affected, and surfaces subject to attrition show marked wear. Brown stain is frequently a disfiguring feature.

4.0 = Severe
Includes teeth formerly classified as "moderately severe" and "severe." All enamel surfaces are affected, and hypoplasia is so marked that the general form of the tooth may be affected. The major diagnostic sign of this classification is the discrete and confluent pitting. Brown stains are widespread, and teeth often present a corroded-like appearance.

Sources: Burt BA, Eklund SA. Dentistry, Dental Practice, and the Community, 5th edition. Philadelphia: W.B. Saunders Company, 1999; Rozier RG. Epidemiologic indices for measuring the clinical manifestations of dental fluorosis: overview and critique. Adv Dent Res 1994 Jun;8(1):39-55.

Procedure Method

Procedure Method

To obtain Dean's Fluorosis Index, the examiner's recording is based on the two teeth most affected. However, if the two teeth are not equally affected, the score for the less affected tooth is recorded. When teeth are scored, the examiner should start at the higher end of the index ("severe") and eliminate each score or category until he or she arrives at the present condition. If there is any doubt, the lower score should be recorded. The scoring and criteria for Dean's original Fluorosis Index are as follows:

Dean's Fluorosis Index - Original Criteria (Dean, 1934)

0 = Normal
The enamel represents the usual translucent semi-vitriform type of structure. The surface is smooth, glossy, and usually of a pale creamy white color.

0.5 = Questionable
... slight aberrations in the translucency of normal enamel, ranging from a few white flecks to occasional white spots, 1 to 2 mm in diameter.

1.0 = Very Mild
Small, opaque, paper-white areas are scattered irregularly or streaked over the tooth surface. It is principally observed on the labial and buccal surfaces, and involves less than 25% of the tooth surfaces of the particular teeth affected. Small pitted white areas are frequently found on the summits of the cusps. No brown stain is present in the mottled enamel of this classification.

2.0 = Mild

The white, opaque areas on the surfaces of the teeth involve at least half of the tooth surface. The surfaces of molars, bicuspids, and cuspids subject to attrition show thin white layers worn off and the bluish shades of underlying normal enamel. Faint brown stains are sometimes apparent, generally on the upper incisors.

3.0 = Moderate
No change is observed in the form of the tooth, but generally all of the tooth surfaces are involved. Surfaces subject to attrition are definitely marked. Minute pitting is often present, generally on the labial and buccal surfaces. Brown stain is frequently a disfiguring complication. It must be remembered that the incidence of brown stain varies greatly in different endemic areas, and many cases of white opaque mottled enamel, without brown stain, are classified as "moderate" and listed in this category.

Moderately Severe
Macroscopically, a greater depth of enamel appears to be involved. A smoky white appearance is often noted. Pitting is more frequent and generally observed on all the tooth surfaces. Brown stain, if present, is generally deeper in hue and involves more of the affected tooth surfaces.

4.0 = Severe
The hypoplasia is so marked that the form of the teeth is at times affected, the condition often being manifest in older children as a mild pathologic incisal-occlusal abrasion. The pits are deeper and often confluent. Stains are widespread and range from a chocolate brown to almost black in some cases.

Source: Rozier RG. Epidemiologic indices for measuring the clinical manifestations of dental fluorosis: overview and critique. Adv Dent Res 1994 Jun;8(1):39-55.

The examiner should observe the distribution pattern of any defects and decide if they are typical of fluorosis. The defects in the "questionable" to "mild" categories are the most likely to occur, and consist of fine white lines or patches usually near the incisal edges or cusp tips (World Health Organization, 1997). They are paper-white or frosted in appearance like a snow-capped mountain and tend to fade into the surrounding enamel (World Health Organization, 1997).

Established Modifications

No established modifications to the Dean's Fluorosis Index since 1942.

Federal Survey Modifications

Note: This section includes excerpts from the National Institute of Dental Research (NIDR) National Survey of Oral Health in U.S. School Children, 1986-1987, and the National Health and Nutrition Examination Survey (NHANES) IV, 1998-2004.

In the NIDR National Survey of Oral Health in U.S. School Children, 1986-1987, there were hardly any modifications made to the examination, criteria, and scoring system for the Dean's Index, except for the clarification in the "Questionable" classification category as outlined below.

For the dental fluorosis exam, the examiner followed the same sequence as for the Decayed, Missing, or Filled Permanent Tooth Surfaces (DMFS) Index exam by starting with the upper left central incisor and continuing distally through to the second molar in the same quadrant. The same sequence was followed for the upper right, lower left, and lower right quadrants. It was also recommended that the examiner should examine each tooth in the following manner: lingual, labial, mesial, and distal for the anterior teeth, and occlusal, lingual, buccal, mesial, and distal for the posterior teeth. A single call was made for each tooth or tooth position present in children from grades 2 to 12. Each tooth was examined and assigned to one of six categories according to its degree of fluorosis. However, no fluorosis assessment was made for deciduous teeth, permanent teeth not in full eruption, or teeth in which more than one-half of the visible surface was obscured by a restoration, caries, or an orthodontic appliance. These tooth spaces were excluded. As in the case of the Dean's Index, classification of a person was based on the two teeth most affected by fluorosis. And, if two teeth were not equally affected, the less involved tooth was used to determine the classification. The criteria and scoring for the Dean's Index along with special diagnostic considerations are noted below:

Dean’s Fluorosis Index - Criteria for NIDR National Survey of Oral Health in U.S. School Children, 1986-1987

Normal - 0
The enamel represents the usual translucent semivitriform type of structure. The surface is smooth, glossy, and usually of a pale creamy white color.

Questionable - .5
The enamel discloses slight aberrations from the translucency of normal enamel, ranging from a few white flecks to occasional white spots. This classification is utilized in those instances where a definite diagnosis of the very mildest form of fluorosis is not warranted and a classification of “normal” is not justified. Included in this category are teeth that show no signs of fluorosis other than 1-2 mm of white opacity at the cusp tips of posterior teeth or incisal edges of anterior teeth.

Very Mild - 1
Small, opaque, paper white areas scattered irregularly over the enamel but involving less than 25 percent of the total surface area.

Mild - 2
The white opaque areas are more extensive but involve less than 50 percent of the total surface area.

Moderate - 3
At least 50 percent of the total surface area is affected. Surfaces subject to attrition often show wear and brown stains may be present.

Severe - 4
The entire surface area is usually affected. The diagnostic sign required for this classification is discrete or confluent pitting of the enamel. With marked confluent pitting, the tooth often presents a corroded-like appearance. Brown stains of intact enamel are often present.

Special Diagnostic Considerations:

Only fully-erupted teeth are scored, using a good source of artificial light. The teeth are not air-dried before scoring.

A tooth is not scored if one-half or more of the visible enamel area is replaced with a restoration or is destroyed by caries or covered with an orthodontic band.

Fluorosis in the milder classifications may be confined to particular areas of the enamel, or may occur irregularly over the entire enamel surface. The area affected is derived by visually coalescing all areas of fluorosis and relating that area to the total area of all visible enamel. For posterior teeth, the visible enamel is composed of the buccal and lingual surfaces, extending from embrasure to embrasure, and the occlusal surface. For anterior teeth, the visible area is composed of the labial and lingual surfaces, extending from embrasure to embrasure.

Because of masticatory abrasion, occlusal surfaces of posterior teeth may show less fluorosis than buccal and lingual surfaces of the same teeth. Also, toothbrush abrasion and continued post-eruptive mineralization may result in gradual decreases in the intensity of fluorosis, particularly in areas of enamel affected by the milder forms of the condition. Thus, the level of fluorosis in a tooth does not always remain constant. Scoring must be based on the current state of the condition.

Staining per se of intact enamel is not a diagnostic criterion specific to any of the classifications. A stained area of fluorosis is considered the same as a non-stained area of fluorosis in determining the total affected area. For example, a tooth that shows severe fluorosis may not necessarily be stained, whereas, another tooth that demonstrates moderate fluorosis may show staining.

Fluorosed teeth do not erupt with pits. Instead, pitting occurs post-eruptively when the teeth are subjected to masticatory forces. A pit is defined as a discrete, focal loss of outermost enamel. The defect is partly or wholly surrounded by a wall of enamel. Initially, the enamel wall is usually intact. With wear, however, the enamel wall can be abraded away, so that often only part of the wall can be detected. In contrast to intact enamel on which the explorer tip can be moved easily across the smooth surface, pitted areas demonstrate a definite physical defect in which the base of the defective area may be either carious or sound. If it is sound, the base of the pit is rough and offers resistance to the lateral movement of the explorer tip, and a scratchy sound is detected when the explorer is moved across it. If the base is carious, it demonstrates softness upon being probed with moderate pressure. The pitted area is usually stained or demonstrates a different color compared with the surrounding enamel.

Confluent pitting of the enamel results from the coalescence of two or more discrete pits. The walls of pits at the occlusal or incisal edges can be abraded, so that only the walls on the gingival aspect remain intact, often leading to an irregular “ledging” effect. In some cases, confluent pitting may advance to a point where such large areas of enamel are corroded that the anatomy of the tooth is altered.

Source: National Institutes of Health, National Institute of Dental Research. Oral Health of United States Children: The National Survey of Oral Health in U.S. School Children, 1986-1987. Washington, DC: U.S. Government Printing Office, 1992.

For the National Health and Nutrition Examination Survey (NHANES) IV, 1998-2004, the criteria for classifying and scoring dental fluorosis were modified from the 1942 Dean's Fluorosis Index.

The examination started with the upper right central incisor and continued distally through to the second molar in the same quadrant. The same sequence was followed for the upper left, lower left, and lower right quadrants. Third molars or wisdom teeth were not examined for this assessment. In all sample persons (SPs) aged 6-49 years old, each fully erupted permanent tooth was examined using a surface reflecting mirror and a No. 23 explorer and assigned to one of six categories according to its degree of dental fluorosis. No air was used to dried the teeth before the exam. For analysis, classification of a person was based on the two teeth most affected by fluorosis. If the two teeth were not equally affected, the classification given to the person was the score for the less involved tooth. Deciduous teeth, permanent teeth not in full eruption, and teeth in which more than one-half of the visible surface area was obscured by a restoration, caries, or an orthodontic appliance were not assessed and coded as cannot be assessed ("9"). The scoring criteria for the Dean's Index as used in NHANES IV along with scoring guidelines and special diagnostic considerations are noted below:

Dean's Fluorosis Index - Criteria for NHANES IV, 1998-2004

0 = Normal (no fluorosis detected)
1 = Very mild (opaque, paper white areas involving less than 1/4 of the tooth surface)
2 = Mild (opaque, paper white areas involving 1/4 to less than 1/2 of the tooth surface)
3 = Moderate (opaque paper white areas involving 1/2 or more of the tooth surface)
4 = Severe (discrete or confluent pitting in involved areas)
5 = Questionable (slight aberration of normal enamel appearance including white flecks)
8 = Nonfluoride opacity
9 = Cannot be assessed

The fluorosis assessment is conducted in the following order:

1. As the exam proceeds tooth by tooth in the same convention as the caries examination, observe the enamel condition of the corresponding bilateral tooth. For example, if initially examining tooth #3, then #14 would be the examined bilateral tooth.

2. If the bilateral tooth relatively exhibits comparable enamel opacities and/or anomalies, then a fluorosis score is appropriately called to the recorder for the initially examined tooth. The extent of fluorosis cannot vary widely from the initially examined tooth to the examined bilateral tooth.

3. Proceed tooth by tooth until each quadrant is scored in the same order and sequence as in the caries examination.

4. Important notes:

   - Because fluorosis always occurs bilaterally in the same arch, dental fluorosis must be established bilaterally before scoring teeth individually.
   - There is only one score per tooth.
   - If the corresponding bilateral tooth cannot be assessed, then the initially examined

tooth is scored as cannot be assessed ("9").
- If the corresponding bilateral tooth is normal, then the initially examined tooth is scored either as normal ("0"), or nonfluoride opacity ("8"), or could not be assessed ("9").
- This survey will use a score of "5" for Dean's "0.5" score. Codes for nonfluoride opacity ("8") and nonassessment ("9") have also been added.

Scoring Guidelines:

These guidelines promote diagnostic consistency. Note that fluorosis is a condition that is generally bilateral.

1. Only fully erupted permanent teeth are scored.

2. Teeth are NOT dried with air prior to examination.

3. A tooth is scored as "9" if it is crowned, missing, not fully erupted, or if one-half or more of the visible enamel is replaced with a restoration, covered with an orthodontic band, or destroyed by caries.

4. If fluorosis occurs irregularly on areas of the enamel surface, determination of the area affected is derived by visually coalescing all areas of fluorosis and relating that amount of area to the total visible surface area.

5. For anterior teeth the visible enamel area is the labial and lingual surfaces extending from embrasure to embrasure. For posterior teeth, the visible enamel area is the facial and lingual surfaces extending from embrasure to embrasure and the occlusal surface.

6. Scoring is based on the extent of fluoride opacities, attrition, and pitting.

7. Staining of intact enamel is not a diagnostic criterion for any of the fluorosis classifications. Note that an area of severe fluorosis may not be stained, whereas, an area of moderate fluorosis may become stained.

8. All nonfluoride opacities are to be scored as code "8" regardless of the suspected etiology.

9. Mild nonfluoride opacities are difficult to distinguish from mild fluoride opacities.

   Mild nonfluoride opacities are more likely to be:

   - Centered on the surface;
   - Round or oval;
   - Clearly differentiated from adjacent enamel; and
   - Pigmented and/or glassy.

10. Mild fluorosis is more difficult to detect under strong light than mild nonfluoride opacities. Tangential viewing improves the likelihood of detecting fluorosis.

Special Diagnostic Considerations:

It is not uncommon to observe bilateral hypoplastic teeth especially with first molars. These should be distinguished from dental fluorosis. In dental fluorosis, all enamel surfaces are affected when pitting is present. In non-fluorosed hypoplastic teeth, part of the unaffected enamel will appear free of enamel opacities.

A tooth is not scored if one-half or more of the visible enamel area is replaced with a restoration, is destroyed by caries, or is covered with an orthodontic band. For posterior teeth the visible enamel is composed of the buccal and lingual surfaces, extending from embrasure to embrasure, and the occlusal surface. For the anterior teeth, the visible area is composed of the labial and lingual surfaces, extending from embrasure to embrasure.

Dental fluorosis in the milder classifications may be confined to particular areas of the enamel, or may occur irregularly over the entire enamel surface. The area affected is derived by visually coalescing all areas of the fluorosis and relating that area to the total area of all visible enamel.

Staining of intact enamel is not a diagnostic criterion specific to any of the classifications and is not taken into consideration in scoring a tooth.

A pit is defined as a discrete, focal loss of outermost enamel. Initially, the enamel wall is usually intact. With wear, however, the enamel wall can be abraded away, so that often only part of the wall can be detected. In contrast to intact enamel on which the explorer tip can be moved easily across the smooth surface, pitted areas demonstrate a definite physical defect in which the base of the defective area may be either carious or sound. If it is sound, the base of the pit is rough and offers resistance to the lateral movement of the explorer tip, and a scratchy sound is detected when the explorer is moved across it. If the base is carious, it demonstrates softness upon being probed with moderate pressure. The pitted area is usually stained or demonstrates a different color compared with the surrounding intact enamel.

Confluent pitting of the enamel results from the coalescence of two or more discrete pits. The walls of pits at the occlusal or incisal edges can be abraded, so that only the walls on the gingival aspect remain intact, often leading to an irregular “ledging” effect. In some cases, confluent pitting may advance to a point where such large areas of enamel are corroded such that the anatomy of the tooth is altered.

If the lingual and buccal surface of a posterior tooth has fluorosis from the occlusal surface to the middle third, but the occlusal surface shows marked attrition, call it moderate.

If the lingual and buccal surface of a posterior tooth has fluorosis involving 25 percent of each surface, but the occlusal surface shows attrition only on the cuspal tips and the rest of the occlusal surface appears normal; the call would be mild, because the total will not add up to 50 percent and there is no marked attrition.

If the lingual and buccal surface of a posterior tooth has fluorosis from the occlusal surface to the middle 3rd, and 100 percent of the occlusal surface has white opacities, it would be moderate. This is because 50 percent of the tooth is affected and the tooth probably has not been subjected to attrition.

If the labial surface of an anterior tooth has fluorosis from incisal to cervical but the lingual is free, the code is mild, because not all surfaces are affected.

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.

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Decayed, Missing, or Filled Permanent Teeth Index

Procedure & Method Information

Name of Procedure/Method Decayed, Missing, or Filled Permanent Teeth Index

Abbreviation DMFT

Purpose To assess the prevalence of coronal caries (i.e., cavities).

Year of Establishment 1938

Type of Procedure/Method

Developer(s) H.T. Klein, C.E. Palmer, and J.W. Knutson

Oral Condition Category

Background Information

Background Information

The Decayed, Missing, or Filled Permanent Teeth (DMFT) Index was originally described by H.T. Klein, C.E. Palmer, and J.W. Knutson in 1938 to determine the prevalence of coronal caries. It is applied only to whole permanent teeth and is composed of three components, the D-component for "Decayed," the M-component for "Missing," and the F-component for "Filled." Filled teeth were assumed to have been unequivocally decayed before restoration (Burt and Eklund, 1999).

For primary dentition, its equivalent is referred to in lowercase lettering, i.e., deft, where "e" indicates "extracted tooth." For the deft index, teeth missing due to complications with exfoliation are not recorded as missing for caries because it is not known whether such teeth were carious before exfoliation (Klein, Palmer, and Knutson, 1938).

The DMFT Index is a simple, rapid, versatile, and universally accepted and applicable measurement that has been used widely for several decades (Burt and Eklund, 1999; World Health Organization, 1999).

Changes Over Time

None

Procedure Method

Procedure Method

To obtain the DMFT Index, the examiner, under favorable lighting conditions and using a No. 3 plain mirror and a fine-pointed pig-tail explorer, will determine the sum of how many teeth are:
"Decayed,"
"Missing" or extracted due to decay, and
"Filled" with either a permanent or temporary restoration as a result of caries involvement.

For the D-component, if a tooth has both a caries lesion and a filling, it is calculated as "D" only. Note that only one call may be made for a given tooth. If two or more conditions exist on the same tooth, then caries receives precedence over a restoration.   When examining a filling for recurrent caries, a defective filling is not considered carious in the absence of definitive visual and tactile criteria for caries.

The maximum number for an individual DMFT score is 28 or 32, if the wisdom teeth are included. For example, a DMFT score of 3+2+5=10 for an individual means that 3 teeth are decayed, 2 teeth are missing, and 5 teeth have fillings. Furthermore, it also means that 18 (i.e., 28 - 10 = 18) teeth are intact. For deciduous or primary teeth, the maximum deft score for an individual would be 20 since primary dentition has a maximum of 20 teeth.

A mean DMFT score for a group (e.g., gender, age) can also be calculated, with the sum of the individual DMFT scores divided by the number of subjects examined.

Established Modifications

Originally, according to the criteria for the World Health Organization (WHO), only teeth missing due to caries were included for its M-component. However, now, for individuals 30 years and older, the M-component should comprise teeth missing due to caries or for any other reason. As well, for subjects under 30 years of age, the M-component should only include teeth missing due to caries (World Health Organization, 1997).

Other procedural modifications can be made to the DMFT index to allow for factors such as secondary caries, crowned teeth, bridge pontics, and any other particular attribute required for study. To save time in large surveys, the DMFT can be used half-mouth, by applying to opposite diagonal quadrants, and the score doubled, an approach that assumes that caries incidence is bilateral (Burt and Eklund, 1999).

In addition, changes to the deft index include the dmft index and dft index. The dmft index is used on children before the ages of exfoliation or applied only to the primary molar teeth. The dft index is numerically the same as the deft index, except that the deft allows for two grades of caries (Burt and Eklund, 1999).

Federal Survey Modifications

For the National Health and Examination Survey (NHANES) I, 1970-74, and the National Institute of Dental Research (NIDR) National Dental Caries Prevalence Survey, 1979-80, the DMFT was not conducted per se, but the evaluation methods were very similar as noted below.

In the NHANES I, 1970-74, each tooth was classified as:

- "Sound,"
- "Decayed,"
- "Missing,"
- "Filled," and
- "Filled-Defective."

For the "Missing" component, permanent teeth were categorized as Unerupted, Carious Extraction, Accidental Loss, and Orthodontic Extraction.

In the National Institute of Dental Research (NIDR) National Dental Caries Prevalence Survey, 1979-80, each tooth was evaluated and coded based on the following criteria:

Tooth Status Call Codes

1 (5) - All primary (permanent) tooth surfaces are scored sound.
2 (6) - At least one primary (permanent) tooth surface is decayed.
3 (7) - At least one primary (permanent) tooth surface is filled; the other tooth surfaces are caries free.
4 - All tooth surfaces are scored unerupted permanent.
8 - All permanent tooth surfaces are scored missing due to caries.
9 - All permanent tooth surfaces are scored missing for other than caries or excluded.

Source: National Institutes of Health, National Institute of Dental Research. Oral Health of United States Children: The National Dental Caries Prevalence Survey, 1979-1980. Washington, DC: U.S. Government Printing Office.

For the remainder of the Federal surveys (i.e., National Institute of Dental Research (NIDR) surveys and National Health and Nutrition Examination Surveys (NHANES)), the DMFT was not conducted, but each tooth was evaluated overall when conducting the examination for the Decayed, Missing, or Filled Permanent Tooth Surfaces (DMFS) Index. For more information, please refer to Federal survey modifications under the procedural method section for the DMFS.

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Decayed, Missing, or Filled Permanent Tooth Surfaces Index

Procedure & Method Information

Name of Procedure/Method Decayed, Missing, or Filled Permanent Tooth Surfaces Index *Abbreviation* DMFS

Purpose To assess the prevalence of coronal caries (i.e., cavities).

Year of Establishment 1938

Type of Procedure/Method

Developer(s) H.T. Klein, C.E. Palmer, and J.W. Knutson

Oral Condition Category

Background Information

Background Information

The Decayed, Missing, or Filled Permanent Tooth Surfaces (DMFS) Index was originally developed in 1938 by H.T. Klein, C.E. Palmer, and J.W. Knutson along with the Decayed, Missing, or Filled Permanent Teeth (DMFT) Index to assess the prevalence of coronal caries (i.e., cavities).

The DMFS Index has three components, the D-component for "Decayed," the M-component for "Missing," and the F-component for "Filled," except that the DMFS is a more detailed index than the DMFT by summing the total number of decayed, missing, and filled permanent tooth surfaces. Its primary dentition equivalent, the defs, is referred to in lowercase lettering, where "e" indicates "extracted tooth."

As in the case of the DMFT Index, the DMFS index is simple and versatile, has practically universal acceptance, and is one of the best known dental indices today (Burt and Eklund, 1999). It is calculated for each subject and can be averaged over subsets of the population.

Changes Over Time None

Procedure Method

Procedure Method

To obtain the DMFS Index, the examiner, with proper lighting and using a No. 3 plain mirror and a fine-pointed pig-tail explorer, will determine the sum of how many tooth sufaces are:

"Decayed,"
"Missing" or extracted due to decay, and
"Filled" with either a permanent or temporary restoration as a result of caries involvement.

A surface with both caries and a filling is scored as "Decayed" or "D." For permanent dentition, the maximum score for the DMFS is 128 (i.e., surfaces) for 28 teeth or 148 for 32 teeth. Molars and premolars are considered as having five surfaces, and front teeth have four.

Primary dentition has a maximum number of 20 teeth, so the maximum score for the defs is 88.

Established Modifications

Procedural modifications can be made to the DMFS index to allow for factors such as secondary caries, crowned teeth, bridge pontics, and any other particular attribute required for study. To save time in large surveys, the DMFS can be used half-mouth, applied to opposite diagonal quadrants and the score doubled, an approach that assumes that caries incidence is bilateral (Burt and Eklund, 1999).

In addition, over time, the defs index has been modified to include the dmfs index and dfs index. The dmfs index is used on children before the ages of exfoliation or applied only to the primary molar teeth. The dfs index is numerically the same as the defs index, except that the defs allows for two grades of caries (Burt and Eklund, 1999).

Federal Survey Modifications

Note: This section includes extracts from "Oral Health Surveys of the National Institute of Dental Research: Diagnostic Criteria and Procedures" and focuses on the following Federal surveys:

- NIDR National Dental Caries Prevalence Survey, 1979-80
- NIDR National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-86
- NIDR National Survey of Oral Health in U.S. School Children, 1986-87
- National Health and Nutrition Examination Survey (NHANES) III, 1988-1994
- National Health and Nutrition Examination Survey (NHANES) IV, 1998-2004

The diagnostic criteria for determining coronal caries for the National Institute of Dental Research (NIDR) surveys and National Health and Nutrition Examination Surveys (NHANES) are:

The D (decayed) component of the DMFS assessment is diagnosed as:

Advanced lesions are detected as gross cavitation and present few problems in diagnosis. However, incipient or early lesions are more difficult to diagnose consistently and may be subdivided into three categories according to location, each with special diagnostic considerations. The categories are:

1. Pits and fissures on occlusal, buccal, and lingual surfaces:

These areas are diagnosed as carious when the explorer catches after insertion with moderate to firm pressure and when the catch is accompanied by one or more of the following signs of decay:

(1) Softness at the base of the area.

(2) Opacity adjacent to the area providing evidence of undermining or demineralization.

(3) Softened enamel adjacent to the area which may be scraped away with the explorer. (This criterion was noted in NIDR National Dental Caries

Prevalence Survey, 1979-80 and NIDR National Survey of Oral in U.S Adults and Seniors, 1985-86.)

In other words, a deep pit or fissure in which the explorer catches is not in itself sufficient evidence of decay; it must be accompanied by at least one of the above-named signs.

2. Smooth areas on buccal (labial) or lingual surfaces:

These areas are carious if they are decalcified or if there is a white spot as evidence of subsurface demineralization and if the area is found to be soft by:

(1) Penetration with the explorer, or

(2) Scraping away the enamel with the explorer. (Care should be taken to avoid removing enamel that could be remineralized.)

These areas should be diagnosed as sound when there is only visual evidence of demineralization, but no evidence of softness.

3. Proximal surfaces:

For areas exposed to direct visual and tactile examination, as when there is no adjacent tooth, the criteria are the same as those for smooth areas on buccal (facial) or lingual surfaces.

For areas not available to direct visual and tactile examination, the following criterion applies: A discontinuity of the enamel in which the explorer will catch is carious if there is softness. In posterior teeth, visual evidence of undermining under a marginal ridge is not acceptable evidence of a proximal lesion unless a surface break can be entered with the explorer. In the anterior teeth, however, transillumination can serve as a useful aid in discovering proximal lesions. Transillumination is achieved by placing a mirror lingually and positioning the examining light so that it passes through the teeth and reflects into the mirror. A characteristic shadow or loss of translucency seen on the proximal surface is indicative of caries on the surface. Ideally, the actual diagnosis should be confirmed with the explorer; however, clear visualization of a lesion by transillumination can justify a positive diagnosis.

Missing Teeth (the M component of the index)

The M (missing) component of the DMFS assessment represents those permanent teeth that have been extracted as a result of caries. It is essential, therefore, to distinguish between teeth extracted because of caries and those extracted or missing for other reasons.

Among all the Federal surveys mentioned above, the NIDR National Dental Caries Prevalence Survey, 1979-80, was the only survey that distinguished between teeth missing for caries and periodontal disease. The remainder of the surveys grouped and coded these two categories (i.e., caries and periodontal disease) together. For further explanation, see the following diagnostic codes for each survey.

Filled Tooth Surface (the F component of the index)

The F component represents a tooth surface that has been filled, with either a permanent or temporary filling, as a result of caries involvement. Here also it is necessary to distinguish between surfaces restored for caries and those restored for other reasons, such as trauma, hypoplasia, or malformation.

In addition, the following scoring guidelines have been adopted in the interest of diagnostic consistency:

1. Incisal edges of anterior teeth are not considered to be separate surfaces. If a lesion or restoration is confined solely to the incisal edge, its score should be assigned to the nearest adjacent surface. Thus, anterior teeth have only four scorable surfaces (mesial, distal, labial, and lingual). The inclusion of the occlusal surface for posterior teeth gives those teeth five surfaces. Therefore, a total of 128 surfaces are examined and diagnosed for each subject. In NHANES IV, it is noted to code the lesion as lingual if it is equidistant from the surfaces.

2. When a filling or a lesion on a posterior tooth, or a caries lesion on an anterior tooth extends beyond the line angle onto another surface, then the other surface is also scored as affected. However, a proximal filling on an anterior tooth is not considered to involve the adjacent labial or lingual surface unless it extends at least one-third of the distance to the opposite proximal surface. The reason for this criterion is that tooth structure on adjacent surfaces must often be removed to provide access for the restoration of a proximal lesion on anterior teeth. Also, to guard against a similar possibility for overestimating the amount of disease in posterior teeth, a proximal restoration should extend at least a millimeter past the line angle before it is considered to involve the adjacent buccal or lingual surface.

3. If a permanent tooth has a full crown restoration placed because of caries, the tooth will be coded as "crown" (e.g., "C"), which represents the maximum number of surfaces for the tooth type, i.e., four surfaces on anterior teeth and five surfaces on posterior teeth. By convention, all crowns on posterior teeth, including abutment teeth for fixed or removable prostheses, are considered to have been placed as a result of caries. On anterior teeth, however, the examiner should determine the reason for crown placement. If a crown was placed for any reason other than caries, such as fracture, malformation, or esthetics, the tooth is coded "excluded" (e.g., "Y"). This rule applies only to permanent teeth with full crowns or jackets. If a tooth has been restored with less than full coverage, all surfaces not involved should be scored in the usual manner. However, in NHANES IV for three-quarter crowns, it stated that when crown coverage extends onto the labial/buccal or lingual surface for cusp protection, the surface is not scored as restored unless coverage extends more than two millimeters cervically from the cusp tip or incisal edge.

4. Teeth that are banded or bracketed for orthodontic treatment are examined in the usual manner, and all visible surfaces are scored.

5. Certain teeth, notably first bicuspids may have been extracted as part of orthodontic treatment. These teeth are coded "missing" (e.g., "M") and will be excluded from the DMFS analysis. The examiner must determine that the teeth were extracted for orthodontic reasons rather than caries, although this is not usually difficult because of

the typically symmetric pattern of these extractions. For the sake of uniformity, all orthodontically extracted bicuspids are scored as first bicuspids. Teeth other than bicuspids may also be extracted for orthodontic reasons. In many cases the subject will have good recall of the reason for the extractions and can help make the correct determination.

6. Non-vital teeth are scored in the same manner as vital teeth. If, however, a restoration on a non-vital tooth was placed solely to seal a root canal and not for caries, that restoration will not be scored. If no other lesions or restorations are present, the tooth will be called sound.

7. Hypoplastic teeth are scored in the usual manner. However, if a restoration on such a tooth was placed solely for esthetic reasons and not for caries, that restoration will not be scored. If a hypoplastic tooth is restored with a full crown, it is to be coded as "excluded" (e.g., "Y").

8. Malformed teeth are scored in the usual manner except when they have been restored with a full crown for esthetic reasons, in which case they are coded as "excluded" (e.g., "Y").

9. When the tooth crown is destroyed by caries and only the roots remain, score all surfaces carious (e.g., X, 0, 1, 2, 3 on posterior teeth and 0, 1, 2, 3 on anteriors).

10. In general, when the same tooth surface is both carious and filled, only the caries is called. Note that only one call may be made for a given surface. If two or more conditions exist on the same surface, then caries receives precedence over a restoration. When a filling is examined for recurrent caries, a defective filling is not considered carious in the absence of definitive visual and tactile criteria for caries.

    However, in NIDR National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-86, when a surface was both carious and restored, both conditions were noted. And if caries was contiguous with a restoration, a "recurrent caries" call was made using double numerical notation (i.e., 55, 66, 77, 88, or 99). Therefore, it was possible to have more than one call per surface. For example, an occlusal surface with a new caries lesion, a sound restoration, and a restored area with recurrent decay was coded for all three conditions (i.e., X, 5, 55).

11. Fractured or missing restorations are scored as if the restoration were intact. If caries is found within or adjacent to the margins of a fractured or missing restoration, caries should be scored. (Criteria are not noted in NIDR National Dental Caries Prevalence Survey, 1979-80 and NIDR National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-86.)

12. In the case of supernumerary teeth, only one tooth is called for the tooth space. The examiner must decide which tooth is the "legitimate" occupant of the space.

13. If both a deciduous and a permanent tooth occupy the same tooth space, only the permanent tooth is scored.

14. Third-year molars are not scored. When examining second molars it is important to note that a drifted third molar may occupy the space of a missing second molar. In such cases, the diagnosis and call must relate to the status of the missing second molar, not the third molar. If the second molar, for example, was extracted because of caries and the space is now occupied by a sound third molar, the second molar is scored as "extracted" (e.g., code "E"), and the third molar is not scored.

15. A tooth is considered to be in eruption when any part of its crown projects through the gum. This criterion is easier to standardize than one that calls for a more advanced stage of eruption.

16. Stain and pigmentation alone should not be regarded as evidence of decay since either can occur on sound teeth.

For the dmfs, decayed and/or filled surfaces of primary or deciduous teeth are scored in the same manner as permanent teeth, using the same diagnostic criteria as stated above. When scoring deciduous teeth, it is necessary to precede the surface calls for deciduous teeth with a "deciduous" call (e.g., code "D") to distinguish them from permanent teeth. The "deciduous" code is combined with any other appropriate diagnostic call for decayed or filled surfaces. For example, if a deciduous molar has occlusal caries and is otherwise sound, the "deciduous" code is combined with the code for occlusal caries (e.g., "D,X"). The diagnostic procedures are exactly the same as for permanent teeth except that the "deciduous" code (e.g., code "D") precedes the surface call/code, and if the deciduous tooth is sound, the "deciduous" code (e.g., code "D") is used alone. All missing deciduous teeth are scored as unerupted permanent teeth (e.g., code "U") to avoid potential problems with scoring since it is often not possible to distinguish exfoliated teeth from teeth extracted due to caries, especially when dentition is mixed. Later in the analysis phase, the age of the child is used to determine the most likely reason for tooth loss.

When conducting the examination for the DMFS Index, an effort should be made to examine each subject in the same manner, regardless of the amount of tooth decay (i.e., caries) or prior treatment. For the DMFS Index, the subject should be examined with a sharp #23 explorer and an unmarred, nonmagnifying, front surface mouth mirror. The teeth should also be dried before each quadrant is examined. In addition, the recorder should be positioned within easy hearing distance of the examiner. The examination sequence should follow the same sequence as shown on the data forms. The forms are arranged by quadrants; the examiner should start with upper left central incisor and continue distally through the second molar in the same quadrant. The same sequence is followed for the upper right, lower left, and lower right quadrants, in that order. It is also necessary to examine each individual tooth in a systematic approach. It is suggested that the surfaces be examined in the following order: lingual, labial, mesial, and distal for anterior teeth, and occlusal, lingual, buccal, mesial, and distal for posterior teeth. However, in NHANES IV, the examination sequence changed. The examination started in the upper right quadrant and continued to the upper left, lower left, and lower right. The tooth surface examination for posterior teeth also changed to lingual, occlusal, buccal, mesial, and distal. It is not advisable to call out individual surface codes as each tooth surface is examined, as this is confusing to the recorder. It is better if the examiner accumulates the diagnostic codes in his or her memory for a given tooth until all surfaces have been examined before dictating the diagnostic codes to the recorder. For the DMFS, the maximum number will be 128 surfaces for 28 teeth since the third-year molars or "wisdom" teeth are not scored for this index. For the previous mentioned Federal surveys, the diagnostic codes for the DMFS Index are as follows:

NIDR National Dental Caries Prevalence Survey, 1979-80

Tooth and Surface Status Call Codes

1 (5) - All primary (permanent) tooth surfaces are scored sound.
2 (6) - At least one primary (permanent) tooth surface is decayed.
3 (7) - At least one primary (permanent) tooth surface is filled; the other tooth surfaces are caries free.
4 - All tooth surfaces are scored unerupted permanent.
8 - All permanent tooth surfaces are scored missing due to caries.
9 - All permanent tooth surfaces are scored missing for other than caries or excluded.

Source: National Institutes of Health, National Institute of Dental Research. Oral Health of United States Children: The National Dental Caries Prevalence Survey, 1979-1980. Washington, DC: U.S. Government Printing Office.

NIDR National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-86

Tooth Status Call Codes

S = Sound Crown (no caries or restorations)
R = Sound Root (no caries or restorations)
C = Full Crown Coverage
U = Unerupted
E = Missing (caries/periodontal diseases)
M = Missing (orthodontic or non-disease)
Y = Exclusion (tooth, root cannot be scored)

Surface Status Call Codes

Caries
X = Occlusal Surface
0 = Lingual Surface
1 = Buccal Surface
2 = Mesial Surface
3 = Distal Surface

Restorations
5 = Occlusal Surface
6 = Lingual Surface
7 = Buccal Surface
8 = Mesial Surface
9 = Distal Surface

Recurrent Caries
55 = Occlusal Surface

66 = Lingual Surface
77 = Buccal Surface
88 = Mesial Surface
99 = Distal Surface

Note: There is no occlusal code, i.e., X or 5 for root surfaces or for the crowns of anterior teeth.

Source: National Institutes of Health, National Institute of Dental Research. The National Survey of Oral Health in U.S. Employed Adults and Seniors, 1985-1986. Washington, DC: U.S. Government Printing Office.

NIDR National Survey of Oral Health in U.S. School Children, 1986-87

Tooth Status Call Codes

S = Sound Permanent Tooth (no caries or restorations)
D = Sound Deciduous Tooth (no caries or restorations)
C = Full Crown Coverage
U = Unerupted
E = Missing (caries/periodontal diseases)
M = Missing (orthodontic or non-disease)
Y = Exclusion

Surface Status Call Codes

Caries
X = Occlusal Surface
0 = Lingual Surface
1 = Buccal Surface
2 = Mesial Surface
3 = Distal Surface

Restorations
5 = Occlusal Surface
6 = Lingual Surface
7 = Buccal Surface
8 = Mesial Surface
9 = Distal Surface

Note: There is no code X or 5 for anterior teeth.

Source: National Institutes of Health, National Institute of Dental Research. Oral Health of United States Children: The National Survey of Oral Health in U.S. School Children, 1986-1987. Washington, DC: U.S. Government Printing Office, 1992.

National Health and Nutrition Examination Survey (NHANES) III, 1988-1994

Tooth Status Call Codes

S = Sound Permanent Tooth (no caries or restorations)
D = Sound Deciduous Tooth (no caries or restorations)
K = Deciduous Tooth with restoration or caries
C = Full Crown Coverage
U = Unerupted
E = Missing without replacements (due to caries/periodontal diseases)
M = Missing without replacements (due to other reasons)
ER = Missing with prosthetic replacements (due to caries/periodontal diseases)
MR = Missing with prosthetic replacements (due to other reasons)
Y = Exclusion

Surface Status Call Codes

Caries
X = Occlusal Surface
0 = Lingual Surface
1 = Buccal Surface
2 = Mesial Surface
3 = Distal Surface

Restorations
5 = Occlusal Surface
6 = Lingual Surface
7 = Buccal Surface
8 = Mesial Surface
9 = Distal Surface

Note: There is no code X or 5 for anterior teeth. For deciduous teeth, call "K" prior to surface status codes.

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey III, 1988-1994. Washington, DC: U.S. Government Printing Office.

National Health and Nutrition Examination Survey (NHANES) IV, 1998-2004

Tooth Status Call Codes

S = Sound Permanent Tooth (no caries or restorations)
Z = Permanent Tooth with surface condition
D = Sound Deciduous Tooth (no caries or restorations)
K = Deciduous Tooth with surface condition
C = Full Crown Coverage
U = Unerupted
E = Missing due to dental disease (caries/periodontal diseases)
M = Missing due to other causes (orthodontic/traumatic or other non-disease)

R = Missing due to dental disease but replaced
X = Missing due to other causes but replaced
Y = Tooth present, condition cannot be assessed

Surface Status Call Codes

Caries
0 = Lingual Surface
1 = Occlusal Surface
2 = Buccal Surface
3 = Mesial Surface
4 = Distal Surface

Restorations
5 = Lingual Surface
6 = Occlusal Surface
7 = Buccal Surface
8 = Mesial Surface
9 = Distal Surface

Note: There is no code 1 or 6 for anterior teeth. Call "Z" prior to surface status codes for permanent teeth and "K" for deciduous teeth.

Soure: National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.

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Dental Aesthetic Index

Procedure & Method Information

Name of Procedure/Method Dental Aesthetic Index

Abbreviation DAI

Purpose To assess need for orthodontic treatment.

Year of Establishment 1986

Type of Procedure/Method

Developer(s) N.C. Cons, J. Jenny, and F.J. Kohaut

Oral Condition Category

Background Information

Background Information

In 1986, the Dental Aesthetic Index (DAI) was developed by N.C. Cons, J. Jenny, and F.J. Kohaut to assess orthodontic treatment need. It is an orthodontic index based on socially defined aesthetic norms (Jenny and Cons, 1996). The DAI has two components, a physical component and an aesthetic component. Unlike the Index of Orthodontic Treatment Needs (IOTN), the DAI is a regression equation or formula that mathematically links societal perceptions of dental aesthetics (i.e., psychosocial) with the objective physical measurements of occlusal traits associated with malocclusion to produce a single score.

The DAI aesthetic component is based on a sampled public's perceptions or ratings of dental aesthetics, illustrated by 200 photographs of occlusal configurations with each showing a full-front view and both right and left profiles. Each photograph also contained 49 anatomical measurements of traits, considered to be important occlusal traits in the development of an orthodontic index (Jenny and Cons, 1996). By using regression analysis, the sample public's rating of dental aesthetics in each of the photographs was related to the anatomical measurements which provided the basis for the 10 occlusal traits selected and their regression coefficient weights.

The 10 occlusal traits are (1) missing teeth (i.e., incisors, canines, and bicuspids), (2) anterior crowding, (3) anterior spacing, (4) diastema (i.e., spacing) between the two maxillary central incisors, (5) the largest anterior irregularity in the maxilla, (6) the largest anterior irregularity in the mandible, (7) overjet, (8) underjet, (9) anterior open bite, and (10) anteroposterior molar relationship.

The DAI is considered to be a quick and useful index for identifying unmet orthodontic treatment needs and as a screening device for determining orthodontic treatment priority. It has demonstrated a high degree of validity and reliability (Cons, Jenny, Kohout, Songpaisan, and Jotikastira, 1989; Jenny and Cons, 1996; Beglin, Firestone, Vig, Beck, Kuthy, and Wade, 2001). Its validity has been recognized nationally and internationally by several governmental agencies such as the U.S. Indian Health Service (IHS).

The DAI has also been adopted by the World Health Organization (WHO) as a cross-cultural index and as a model for the WHO's Pathfinder Survey protocol (Burt and Eklund, 1999; Beglin, Firestone, Vig, Beck, Kuthy, and Wade, 2001).

Changes Over Time

None

Procedure Method

Procedure Method

The DAI can be obtained from study models or directly from the mouth (i.e., intraorally) without the use of radiographs. The 10 occlusal traits listed below are scored and/or measured. Then, these trait scores/measurements are multiplied by their actual or rounded weights (i.e., regression coefficients) provided within the parentheses below, and the products are summed with the constant number, 13, to compute the DAI score. For example, in the following hypothetical case using rounded weights, the occlusal traits present are:

Crowding (both segments crowded) - score 2 x 1 = 2
Largest irregularity in maxilla is 2 mm - score 2 x 1 = 2
Largest irregularity in mandible is 3 mm - score 3 x 1 = 3
Molar relationship is one full cusp - score 2 x 3 = 6
Add the constant number, 13, to total = 13
Total is the DAI score (rounded) = 26

When using the rounded weights to calculate the DAI score, the DAI equation is thought to lose relatively little precision, which is considered a small trade-off for the convenience in many clinical and research applications.

Dental Aesthetic Index (DAI)

Components
1. Number of missing visible teeth - incisors, canines, and premolars (i.e., bicuspids) in the maxillary and
   mandibular arches (5.76, 6)*
2. Assessment of crowding in the incisal segments: 0 = no segments crowded; 1 = 1 segment crowded; 2 = 2
   segments crowded (1.15, 1)*
3. Assessment of spacing in the incisal segments: 0 = no segments spaced; 1 = 1 segment spaced; 2 = 2 segments
   spaced (1.31, 1)*
4. Measurement of any midline diastema in mm (3.13, 3)*
5. Largest anterior irregularity on the maxilla in mm (1.34, 1)*
6. Largest anterior irregularity on the mandible in mm (.75, 1)*
7. Measurement of anterior maxillary overjet in mm (1.62, 2)*
8. Measurement of anterior mandibular overjet in mm (3.68, 4)*
9. Measurement of vertical anterior openbite in mm (3.69, 4)*
10. Assessment of anteroposterior molar retention; largest deviation from normal either left or

right, 0 = normal,
1 = 1/2 cusp either mesial or distal, 2 = 1 full cusp or more either mesial or distal (2.69, 3)*

Constant (13.36, 13)*
Total = DAI score (actual or rounded)

*Note: (actual weight, rounded weight)

Source: Jenny J, Cons NC. Comparing and contrasting two orthodontic indices, the Index of Orthodontic Treatment Need and the Dental Aesthetic Index. Am J Orthod Dentofacial Orthop. 1996 Oct;110(4):410-6.

Although the DAI was developed for use in permanent dentition, its procedure may easily be adapted for use in mixed dentition. Instead of counting the number of missing incisors, canines, and bicuspids, a mixed dentition modification is used: When scoring a case of mixed dentition, the space from a recently exfoliated deciduous or primary tooth is not scored as "missing" if it appears that the permanent replacement will erupt soon.

The DAI has decision points for categorizing severity levels that approximate treatment needs. DAI scores of 25 and below represent normal or minor malocclusions with no or slight treatment need, scores 26 to 30 represent definite malocclusions with treatment elective, scores 30 to 35 are severe malocclusions with treatment highly desirable, and scores 36 and higher represent very severe or handicapping malocclusions with treatment considered mandatory. In the hypothetical example above, the DAI score of 26 is considered definite malocclusions with treatment elective. The decision points may also be modified for publicly funded programs to meet available resources (e.g., personnel and financial).

In addition, an individual's DAI score can be placed on a continuous scale to determine the point at which the score falls between the most and the least socially acceptable dental appearance or the percentile at which an individual's DAI score falls on the scale can serve as a deviation estimate from societal's most acceptable dental appearance. The farther the DAI score falls from the norm of most acceptable dental appearance, the more likely the malocclusion is socially, psychologically, and physically handicapping. By placing DAI scores on a continuous scale, the scores can be rank ordered, from 13 to 80 or higher, to differentiate cases with greater or lesser need for treatment within severity levels.

Established Modifications

None

Federal Survey Modifications

None

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Dental Caries Severity Classification Scale

Procedure & Method Information

Name of Procedure/Method Dental Caries Severity Classification Scale

Abbreviation D1-D3 Scale

Purpose To aid in the diagnosis of coronal caries.

Year of Establishment 1979

Type of Procedure/Method

Developer(s) World Health Organization (WHO)

Oral Condition Category

Background Information

Background Information

The D1-D3 scale was first published by the World Health Organization in 1979 as an aid to diagnosing coronal caries. It is traditionally used among European investigators who diagnose dental caries from the earliest detectable noncavitated lesion through to pulpal involvement. It is said to be of extreme value in research studies because it permits identification of lesion progression as well as initiation (Burt and Elkund, 1999).

In contrast, investigators in North America, Britain, and other English-speaking countries traditionally diagnose coronal caries once they have reached the level of dentinal involvement or the D3 stage.

Changes Over Time None

Procedure Method

Procedure Method

The D1-D3 scale requires the subject's teeth be dried prior to the examination. The scale is as follows:

0: Surface Sound. No evidence of treated or untreated clinical caries (slight staining allowed in an otherwise sound fissure).

D1: Initial Caries. No clinically detectable loss of substance. For pits and fissures, there may be significant staining, discoloration, rough spots in the enamel that do not catch the explorer, but loss of substance cannot be positively diagnosed. For smooth surfaces, these may be white, opaque areas with loss of luster.

D2: Enamel Caries. Demonstrable loss of tooth substance in pits, fissures, or on smooth surfaces, but no softened floor or wall or undermined enamel. The texture of the material within the cavity may be chalky or crumbly, but there is no evidence that cavitation has penetrated the dentin.

D3: Caries of Dentin. Detectably softened floor, undermined enamel, or a softened wall, or the tooth has a temporary filling. On approximal surfaces, the explorer point must enter a lesion with certainty.

D4: Pulpal Involvement. Deep cavity with probable pulpal involvement. Pulp should not be probed. (Usually included with D3 in data analysis.)

Source: Burt BA, Eklund SA. Dentistry, Dental Practice, and the Community, 5th edition. Philadelphia: W.B. Saunders Company, 1999.

Using the D1-D3 scale involves a very lengthy and detailed examination. Therefore, its use requires meticulous examiner training, for if D1 lesions are capable of regressing back to sound enamel, it becomes difficult to differentiate examiner error from natural phenomena. Although there are more diagnostic decisions to be made, adequate examiner reliability can be maintained when examiners have been trained in this system (Burt and Elkund, 1999; Pitts, 1993).

Even though it is said the D1-D3 scale is very valuable for research studies, there is less consensus within the research community on its use in large-scale surveys. However, for the present time, this debate (i.e., pro or con) is evenly split.

Established Modifications None

Federal Survey Modifications None

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Validaty

Reliability

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Dental Impact Profile

Procedure & Method Information

Name of Procedure/Method Dental Impact Profile

Abbreviation DIP

Purpose To assess the importance and impact of dentition in daily life.

Year of Establishment 1993

Type of Procedure/Method

Developer(s) R.P. Strauss and R.J. Hunt

Oral Condition Category

Background Information

Background Information

In 1993, R.P. Strauss and R.J. Hunt introduced the Dental Impact Profile (DIP) to measure the perceived value and impact of dentition (i.e., natural teeth or dentures) in daily life activities such as eating, health, and relationships.

The DIP is a simple, easy, and quick instrument that consists of 25 items that evaluate how natural teeth and/or dentures affect, either positively, negatively, or not at all, the self-perceived social, psychological, and biological aspects of quality of life.

Changes Over Time None

Procedure Method

Procedure Method

The DIP is administered by a trained interviewer. Each item is asked in a question format as written below. The DIP results are expressed as frequency or percentage distributions and not as mean scores.

Dental Impact Profile (DIP)

Instructions: As part of this study, I will be asking you to think about how your teeth affect your life. Answer only what you feel and have experienced, not what you think is the right answer. There is no right or wrong answer to these questions.

1. Good Effect
2. No Effect
3. Bad Effect

Do you think your teeth or dentures have a good (positive) effect, a bad (negative) effect, or no effect on your: ____________________?

1. feeling comfortable ______
2. having confidence around others ______
3. eating _____
4. tasting _____
5. living a long life _____

6. chewing and biting _____
7. appearance to other people (how you look to others) _____
8. moods _____
9. kissing _____
10. general health _____

11. attendance at activities _____
12. success at work _____
13. appetite _____
14. smiling and laughing _____
15. having sex appeal _____

16. facial appearance (how your face looks to you) _____
17. social life _____
18. enjoyment of eating _____
19. speech _____
20. breath _____

21. foods you chose to eat _____
22. enjoyment of life _____
23. romantic relationships _____
24. general happiness _____
25. weight _____

Source: Strauss RP. Culture, dental professionals and oral health values in multicultural societies: measuring cultural factors in geriatric oral health research and education. Gerodontology. 1996 Dec;13(2):82-9.

Established Modifications None

Federal Survey Modifications None

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Digital Radiography of Interproximal Bone Loss

Procedure & Method Information

Name of Procedure/Method Digital Radiography of Interproximal Bone Loss *Abbreviation* N/A

Purpose To measure or monitor changes with periodontal bone loss.

Year of Establishment N/A *Type of Procedure/Method*

Developer(s) N/A *Oral Condition Category*

Background Information

Background Information Radiographs are useful diagnostic tools since they provide a view of the amount of bone present for determining linear measurements (i.e., 1-dimensional assessment) of bone loss, as well as area and volume measurements (i.e., 2- and 3-dimensional assessments, respectively). In addition, radiographs allow for interproximal bone loss or gain to be determined by comparing subsequent radiographs to the initial radiograph.

Conventionally, measuring or monitoring the changes in the location and/or the structure of the alveolar bone was done by placing a micrometer (MM), a metal ruler, on radiographs to calculate the percentage of bone loss. Although, due to factors such as film angulation, direction of the roentgen rays, exposure parameters, and radiographic processing, the sensitivity of radiographs as a quantitative tool for measuring bone loss is decreased (Reddy, 1992). However, with the use of computer technology, more advanced methods have been developed that increase precision while reducing error.

Changes Over Time N/A

Procedure Method

Procedure Method Digital Imaging:

All forms of digital imaging require a computer, detectors, and an analog to digital conversion (Dental Diagnostic Science, 2001). A computer provides the means for acquiring, storing, processing, retrieving, and displaying the digital image. The detectors convert transmitted light from a conventional radiograph or a remnant x-ray beam into an electronic signal, and an electronic signal must be converted from an analog form to a digital form (Dental Diagnostic Science, 2001).

The first step in digital radiography is to convert a radiographic image into a digital form that can be stored on a computer. This can be done by indirect digital imaging and direct digital imaging. Indirect digital imaging digitizes an existing film-based radiograph using a video camera with an attached solid-state detector (e.g., charged-coupled device (CCD)), whereas direct digital imaging utilizes an intraoral sensor with a solid-state detector that is positioned at the area of interest with a positioning device.

Indirect digital imaging utilizes existing film-based radiographs, so the radiographs must be standardized to prevent or reduce errors of angulation and x-ray direction. Standardized radiographs can be acquired in one of three ways: utilization of a stent, a cephalostat head holder, or real-time video feedback (Reddy, 1992). There is an advantage to using the direct digital imaging system because images are immediately obtained and the time required for processing and indirect digitization is eliminated (Reddy, 1992). The gray level in a direct digital image may also be adjusted before it is stored on the computer, and the detector is much more sensitive than dental film, thus allowing the exposure dose to be reduced to approximately 91 to 96 percent. The only limitations are the size and the resolution of the direct digital detector (Reddy, 1992).

Once the image is in digital format and displayed on the computer monitor, the next step is to process the image by fine-tuning the picture elements and/or features (i.e., contrast, spatial, noise) of the image. Image processing can be divided into three different operations, image analysis, image enhancement, and image encoding (Dental Diagnostic Science, 2001). Common image enhancement operations used in dentistry include contrast manipulations, spatial filtering, subtraction, and pseudo-color (Dental Diagnostic Science, 2001). Digital image subtraction is an enhancement technique used to remove the structural noise of the image. For image encoding, two basic types exist, lossless and lossy algorithms (Dental Diagnostic Science, 2001).

Techniques to Measure Interproximal Bone Loss:

Whether the image was obtained via indirect or direct digital imaging, the techniques to determine interproximal bone loss include bone-height measurements, a 1-dimensional assessment, area or 2-dimensional measurements, and digital subtraction radiography.

In regard to digital subtraction radiography, it has allowed for the first quantitative assessments of attachment loss from a 3-dimensional aspect (Reddy, 1992). In digital subtraction a standardized radiographic image is taken before the appearance of an anatomical change such as interproximal bone loss and is subtracted from subsequent standardized radiographs, resulting in a subtraction image of the anatomical structure that has undergone change. Therefore, the structures that have not undergone change will subtract out and appear as neutral gray, bone loss will appear as a darker gray, and areas of bone gain will appear as a light gray (Reddy, 1992). The subtraction image also can be electronically enhanced to fine-tune its features once it has been stored. Digital subtraction requires identical or almost identical projections for the initial and subsequent radiographs, the ability to properly align two images, technically known as registration, and the ability to correct for variations associated with exposure and processing (Dental Diagnostic Science, 2001). Other techniques include CADIA (i.e., computer-assisted densitometric image analysis), a more advanced method in densitometric analysis.

These methods (i.e., digital substraction and CADIA) are more precise than the conventional method but are sensitive to film positioning error since they require serial radiographs to be identical in geometry and size to the first radiograph (Verdonschot, Sanders, and Plasschaert, 1991; Reddy, 1992). So, in 1984, it was suggested by M.K. Jeffcoat and R.C. Williams that linear measurements of crest heights be used in digitized radiographs to measure alveolar bone loss around the root(s) of a tooth. This method was determined to be more effective than digital subtraction and CADIA since it was less sensitive to film positioning errors, making it very useful and reliable for clinical trials and follow-up studies (Verdonschot, Sanders, and Plasschaert, 1991).

One method, in particular, the IAS for image analysis system has been demonstrated to be a precise and accurate measuring device. It is an example of indirect digital imaging utilizing linear or bone-height measurements to determine bone loss. A brief description of the IAS is noted below.

When testing the IAS, a large metal ball with known diameter along with other small metal balls were attached to the tooth under study at specific sites (e.g., the mesial and distal surfaces at the crown and apex) and used as reference points since a ball's radiographic projections are circles, regardless of the angulation during exposure. In addition, the balls provided an excellent contrast on the radiograph. A radiolucent adhesive was also used on the tooth. Then, the tooth was x-rayed, and the radiographs were developed and digitized by the IAS.

Next, in the digital image, the borders of the metal balls were located by two methods for comparison, histogram-based binarization and ellipse fitting, to determine the location of the measuring points for the IAS measurements. A histogram-modification was also conducted to determine the location of the bone crest border.

To obtain the IAS measurement, first, the number of pixels on the diameter of the large reference ball were determined by IAS. The diameter of the large reference ball was known, so dividing the diameter measurement by the number of pixels equals the reference length for one pixel. As a result, the number of pixels on the target distances in the digital image were counted and multiplied by the reference length of one pixel. Whenever there were two measuring points that were not in the same row or column of pixels, the Pythagorean theorem was used (Verdonschot, Sanders, and Plasschaert, 1991).

Established Modifications N/A

Federal Survey Modifications N/A

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Reliability

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Extent and Severity Index

Procedure & Method Information

Name of Procedure/Method Extent and Severity Index

Abbreviation ESI

Purpose To assess the extent and severity of periodontitis.

Year of Establishment 1986

Type of Procedure/Method

Developer(s) J.P. Carlos, M.D. Wolfe, and A. Kingman

Oral Condition Category

Background Information

Background Information

The Extent and Severity Index (ESI) was developed in 1986 by J.P. Carlos, M.D. Wolfe, and A. Kingman to assess the extent (i.e., number of sites affected within the mouth) and severity (i.e., stage of advancement) of loss of periodontal attachment (LPA) by determining the percentage of sites within the mouth with LPA greater than 1 millimeter (i.e., extent) and the mean LPA for affected sites (i.e., severity). The ESI utilizes the Ramfjord method to measure loss of periodontal attachment.

Despite its name, some consider the ESI not to be a true index since it summarizes data and is descriptive rather than analytical (Burt and Eklund, 1999). According to its developers, the ESI is not intended for clinical diagnoses or describing individual subjects; however, it can provide suggestive information about contrasting patterns of disease among different populations or subsets (Carlos, Wolfe, and Kingman, 1986).

The ESI is considered to be a simple and reproducible procedure requiring minimal examiner training (Carlos, Wolfe, and Kingman, 1986). It can be used in a variety of survey types such as prevalence suveys and longitudinal studies. Furthermore, the ESI has demonstrated relatively the same level of reliability in partial mouth examinations versus full mouth examinations (Carlos, Wolfe, and Kingman, 1986).

Changes Over Time None

Procedure Method

Procedure Method

To obtain the ESI, use a random procedure (e.g., a coin toss) to select which upper quadrant to examine. The contralateral quadrant in the lower arch is then automatically decided. Afterwards, in the two designated quadrants, examine the mid-buccal and the mesio-buccal aspects of each tooth using the Ramfjord procedure. This results in a maximum of 28 measurements (i.e., a maximum of 14 measurements in each quadrant) for each subject. Third molars are not examined. Other areas of the dentition, such as the anterior and posterior segments, may also be utilized when comparisons are of interest (Carlos, Wolfe, and Kingman, 1986).

To obtain the measurements using the Ramfjord method, first measure from the gingival margin to the base of the pocket to determine pocket depth. Then, determine the location of the cementoenamel junction (CEJ) by touch with the probe and measure from the CEJ to the gingival margin. All measurements are estimates of the level of periodontal tissue attachment and should be rounded off to the nearest millimeter (mm). Afterward, subtract the second measurement from the first measurement to obtain the indirect measure of LPA. When the gingival crest is located apically to the CEJ, the first measurement is recorded as a negative number (Carlos, Wolfe, and Kingman, 1986).

For the ESI, a tooth site is considered diseased only when loss of attachment exceeds 1 mm. So as stated earlier, disease extent, E, is expressed as the percentage of sites among examined sites with an LPA greater than 1 mm. Disease severity, S is expressed as the mean loss of attachment, in excess of 1 mm, for affected or diseased sites. So, the ESI is written as follows where E is rounded off to the nearest whole number (Carlos, Wolfe, and Kingman, 1986).

$$ESI = (E, S)$$

An ESI expressed as (27, 1.34) means, on average, 27% of sites examined showed evidence of disease, with an average severity of 1.34 mm loss of attachment per diseased site.

In addition, for interpretation, an ESI of (60, 2.0) suggests a generalized but mild form of periodontal disease whereas an ESI of (20, 6.0) suggests a severe localized form of periodontal involvement (Carlos, Wolfe, and Kingman, 1986).

Established Modifications None

Federal Survey Modifications None

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Faces Pain Scale

Procedure & Method Information

Name of Procedure/Method Faces Pain Scale

Abbreviation FPS

Purpose To assess the intensity of pain among children.

Year of Establishment 1990

Type of Procedure/Method

Developer(s) D. Bieri, R.A. Reeve, G.D. Champion, L. Addicoat, and J.B. Ziegler

Oral Condition Category

Background Information

Background Information

In 1990, the Faces Pain Scale (FPS) was presented by D. Bieri, R.A. Reeve, G.D. Champion, L. Addicoat, and J.B. Ziegler to assess the intensity of pain among children since children have greater difficulty expressing or communicating their level of pain, when compared to adults, due to their level of mental development and verbal fluency (Bieri, Reeve, Champion, Addicoat, and Ziegler, 1990).

The FPS is a horizontal 7-point pediatric face interval scale, ranging from 0 to 6, that measures the various levels of pain (e.g., dental and orofacial pain, cancer pain, or postsurgical pain). Each face has a corresponding numerical value. For example, at the low end of the scale (i.e., "0"), a neutral face is used to depict no pain, and at the high end on the FPS, the face with the most severe depiction of pain without tears corresponds to the numerical value of 6.

This scale is nonverbal, requires minimal instruction, is simple and quick to use, and has demonstrated a high degree of validity and reliability. It has been used on and has shown good comprehension with children as young as 3 years old (Bieri, Reeve, Champion, Addicoat, and Ziegler, 1990). In addition, the FPS has also demonstrated that it is a valid and reliable measure when used with mature adult and elderly populations (Herr, Mobily, Kohout, Wagenaar, 1998; Stuppy, 1998).

Changes Over Time None

Procedure Method

Procedure Method

For the FPS, the child is asked to point to the face that shows how much pain he or she feels. Then, the child's response is scored by recording the corresponding scale number to the face chosen. The FPS can be administered by a health care professional, a parent, or a older child.

Established Modifications	In 2001, the FPS was revised to a six-face interval scale called the Face Pain Scale-Revised (FPS-R) by C.L. Hicks, C.L. Von Baeyer, P.A. Spafford, I. Van Korlaar, B. Goodenough, so the scaling could be consistent with other observational and self-reported pain assessment tools. The FPS-R scaling or scoring can range either from 0 to 5 or 0 to 10 (i.e., 0-1-2-3-4-5 or 0-2-4-6-8-10). Previously, in 1997, G.D. Champion and colleagues introduced the Sydney Animated Facial Expressions (SAFE) Scale, a computerized animated version of the FPS in which a single animated face varies smoothly from "no pain" to "very much pain" (Hicks, Von Baeyer, Spafford, Van Korlaar, Goodenough, 2001). The animation consists of 101 frames that are scored from 0 to 100. The animation is controlled by depressing the keyboard keys. Pressing the left arrow key causes the facial features to change in the direction of less pain, and more pain for the right arrow key.
Federal Survey Modifications	None

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Fluorosis Risk Index

Procedure & Method Information

Name of Procedure/Method Fluorosis Risk Index

Abbreviation FRI

Purpose To assess risk for fluorosis.

Year of Establishment 1990

Type of Procedure/Method

Developer(s) D.G. Pendrys

Oral Condition Category

Background Information

Background Information

In 1990, D.G. Pendrys developed the Fluorosis Risk Index (FRI) to investigate risk factors for fluorosis by identifying the associations between age-specific exposures to fluoride sources and the development of enamel fluorosis. It is designed for analytical epidemiologic study usage.

Even though the FRI is thought to be a complex index from a biological perspective and in application (Rozier, 1994), it has been demonstrated to be highly reliable and valid when identifying risk factors for enamel fluorosis (Pendrys, 1990; Rozier, 1994).

Changes Over Time None

Procedure Method

Procedure Method

The FRI divides the enamel surfaces (i.e., buccal and occlusal surfaces) of each permanent tooth, excluding the third molars, into into four scoring zones: (1) incisal edge/occlusal table, defined as the enamel surface within one millimeter of the incisal edge of the tooth; (2) the incisal edge/occlusal third of the buccal surface; (3) the middle third of the buccal surface; and (4) the cervical third of the buccal surface (Pendrys, 1990) based on the age at which calcification begins and selectively assigns each zone into one of two classifications, designated either as having begun formation during the first year of life (i.e., birth to first birthday) as Classification I or during the third through the sixth year of life (i.e., between the second and sixth birthday) as Classification II.

Based on tooth development, the incisal edges of the mandibular central and lateral incisors and the maxillary central incisors, and the occlusal tables of the mandibular and maxillary first molars are assigned to Classification I. The cervical thirds of the incisors, the middle thirds of the canines, and the occlusal table, incisal third, and middle third of the bicuspids and second molars in both the mandibular and maxillary arches are assigned to Classification II. The formation of remaining enamel surface zones were considered to be questionable, so they were not assigned to a classification category, based on the available tooth development literature, or where their development occurred after 5 years of age (Rozier, 1994).

In all, approximately 112 zones are scored, with 10 belonging to Classification I, 48 to Classification II, and the remaining 54 to unassigned zones. Methods to be used are not provided in the publication describing the index (Pendrys, 1990); however, it appears the teeth should be dried before examination (Pendrys and Katz, 1989).

Each visible surface zone is scored according to the following criteria:

Negative Finding: Score = 0
A surface zone in which there is absolutely no indication of fluorosis present. There must be a complete absence of any white spots or striations, and the tooth surface coloration must appear normal.

Questionable Finding:
Score = 1
Any surface zone that is questionable as to whether there is fluorosis present (i.e., white spots, striations, or fluorotic defects that cover 50 percent or less of the surface zone).

Score = 7
Any surface zone that has an opacity that appears to be a nonfluoride opacity.

Positive Finding:
Score = 2 (mild-to-moderate fluorosis)
A surface zone with greater than 50 percent of the zone displaying parchment white striations, in addition to the incisal edges and occlusal tables with greater than 50 percent of the surface marked by snow-capping.

Score = 3 (severe fluorosis)
A surface zone with greater than 50 percent of the zone that displays pitting, staining, and deformity.

Surface Zone Excluded:
Score = 9
A surface zone is categorized as excluded (i.e., not adequately visible for diagnosis) when any of the following conditions exist:

(1) Incomplete eruption
Rule 1: If a tooth is in proximal contact but the occlusal surface is not parallel with existing occlusion, the occlusal two-thirds of the tooth is scored, but the cervical one-third is recorded as excluded.
Rule 2: If a tooth is erupted, but not yet in contact, the incisal/occlusal edge is scored, but all other surfaces are recorded as excluded.

(2) Orthodontic appliances and bands:
Rule 1: If there is an orthodontic band present on a tooth only the occlusal table or incisal edge should be scored.
Rule 2: If greater than 50 percent of the surface zones are banded, the subject should be excluded from the examination.

(3) Surface crowned or restored:
Rule: Surface zones that are replaced by either a crown or restoration covering greater than 50 percent of the surface zone should be recorded as excluded.

(4) Gross plaque and debris:
Rule: Any subject with gross deposits of plaque or debris on greater than 50 percent of the surface zones should be excluded from the examination.

Source: Pendrys DG. The fluorosis risk index: a method for investigating risk factors. J Public Health Dent. 1990 Fall;50(5):291-8.

As a result of the above, identification of fluorosis cases and controls are based on fluorosis scores on these assigned tooth zones, creating Classification I cases and controls and Classification II cases and controls. For example, a Classification I case is defined as a subject who has a positive score on two or more of the enamel surface zones assigned as Classification I zones. A Classification II case is a subject who has a positive score on two or more of the enamel surface zones assigned as Classification II zones. For controls, a Classification I control is a subject who has no positive or questionable scores on any of the enamel surface zones assigned to Classification I and not more than one positive score on any other surface zone. Likewise, a Classification II control is a subject who has no positive or questionable scores on any of the enamel surface zones assigned to Classification II and not more than one positive score on any other surface zone. All individuals who fail to meet the criteria to be either cases or controls are considered questionable.

In addition, for each classification, a subject with more than one excluded assigned zone (i.e., score 9) is ineligible to become a control for that classification, even if the remainder of the surface zones assigned to that classification were scored negative.

To obtain the FRI score for each individual, the scores for Classification I and II are combined into one summary score. Once the above information is collected, the FRI can be used to calculate estimates of relative risk or odds ratios.

Established Modifications None

Federal Survey Modifications None

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Reliability

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FS-T Index

Procedure & Method Information

Name of Procedure/Method FS-T Index

Abbreviation FS-T

Purpose To assess dental health status rather than dental disease in relation to caries.

Year of Establishment 1987

Type of Procedure/Method

Developer(s) A. Sheiham, J. Maizels, and A. Maizels

Oral Condition Category

Background Information

Background Information

In 1987, the FS-T Index was the first composite indicator index developed by A. Sheiham, J. Maizels, and A. Maizels to measure dental health and functional status rather than disease.

The FS-T is considered the functional measure or the number of functioning teeth, defined as the aggregate of healthy restored (i.e., filled) teeth (otherwise sound) and sound teeth with no decay. The argument being that sound and restored teeth have equivalent function (Sheiham, Maizels, and Maizels, 1987).

Very little research can be found utilizing this index. According to some, it is a sound approach to measuring dental health and function rather than disease that probably deserves more attention than it has received (Burt and Eklund, 1999). The FS-T has been determined to be a more reliable indicator of dental health status than the conventional DMFT Index and more efficient at revealing the antecedent and behavioral factors that are associated with dental health status (Benigeri, Payette, and Brodeur, 1998; Sheiham, Maizels, and Maizels, 1987).

For example, the number of decayed, filled, and missing teeth to derive the DMF value is, in essence, equivalent to assigning equal weights to each of these three categories. Therefore, the transformation of a decayed tooth into a filled tooth by restoration has no effect on the DMF value (Sheiham, Maizels, and Maizels, 1987). In addition, the DMF value, specifically the number of filled teeth, distorts the disease experience score of those who have regular dental check-ups and who observe a preventive approach to their dental health (Sheiham, Maizels, and Maizels, 1987).

Changes Over Time None

Procedure Method

Procedure Method	The FS-T is determined by the following formula: FS-T = Filled Teeth + Sound Teeth
Established Modifications	The modified version of the FS-T is called the FMI, for Functional Measure Index. The FMI was used on data from the 1980 Iowa Survey of Oral Health and on aggregate data published from three national surveys (i.e., the Decayed, Missing, and Filled Teeth in Adults, United States, 1960-1962, the Basic Data on Dental Examination Findings of Persons 1-74 years, United States, 1971-1974, and the Oral Health of United States Adults, 1985) (Jakobsen and Hunt, 1989). As a result, the FMI was determined to be as easy to measure and calculate as the DMFT, and appeared to be a more sensitive indicator of dental health status (Jakobsen and Hunt, 1989). The FMI is the FS-T divided by 28 to make its range of scores from 0 to 1. The formula is as follows: FMI = (Filled Teeth + Sound Teeth)/28
Federal Survey Modifications	None

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Jakobsen JR, Hunt RJ. Validation of oral status indicators. Community Dent Health. 1990 Sep;7(3):279-84.

Functional Occlusal Contacts Index in the National Health and Nutrition Examination Survey (NHANES) IV

Procedure & Method Information

Name of Procedure/Method Functional Occlusal Contacts Index in the National Health and Nutrition Examination Survey (NHANES) IV

Abbreviation FOCI

Purpose To assess the functional occlusion of permanent dentition.

Year of Establishment 1998

Type of Procedure/Method

Developer(s) National Center for Health Statistics (NCHS), United States

Oral Condition Category

Background Information

Background Information

The Functional Occlusal Contacts Index (FOCI) was developed by the National Center for Health Statistics (NCHS) to assess the functional occlusion of permanent dentition. However, the ideology of the FOCI was introduced as early as the 1980s by A.F. Kayser. There were also further investigations conducted by his colleague, D.J. Witter.

Concepts similar to the FOCI have been widely used in epidemiologic surveys throughout Europe (Steele, 1998; Witter, van Palenstein Helderman, Creugers, and Kayser, 1999) and in other countries such as Brazil (Elias and Sheiham, 1998) and Thailand (Adulyanon, Vourapukjaru, and Sheiham, 1996) since the reliability is reported as being nearly 100% due to its straightforward nature (NIDCR, 2001).

For the National Health and Nutrition Examination Survey (NHANES) IV, 1998-2004, the oral health examination will include a functional occlusal contacts assessment directly after the tooth count assessment. The functional occlusal contacts component will be evaluated by the FOCI, which consists of an assessment of the posterior (i.e., premolar and molar) regions and a count of the number of anterior tooth contacts. Sampled persons aged 35 years and older will receive this assessment since a substantial number of people in the United States begin to experience tooth loss at this age.

Changes Over Time N/A

Procedure Method

Procedure Method

In NHANES IV, the sample person is first instructed to close his/her back teeth in the normal manner. Then, using a mouth mirror to hold back the cheek, the examiner views the mandibular (lower) arch from the side and records the distribution of contacts. A contact is the same as an occlusal stop. In a quadrant, there are eight possible zones of contact in the posterior region. Each premolar (bicuspid) has a single zone of contact, and each molar is counted as two zones of contact since they are about twice as wide.

The sequence of the exam and scoring begins in the posterior regions from right to left, starting distal to the cuspid (canine) and counting the number of occlusal contacts distally. For the posterior regions, the occlusal contacts are scored or coded according to the codes and criteria outlined below, irrespective of which teeth are in contact. For example, irrespective of which teeth are in contact, if a contact is present for a natural tooth to a natural tooth, the contact is coded as "1."

Posterior Functional Contacts

Score	Criteria
0	No posterior functional contact.
1	Functional contact present between two natural teeth.
2	Functional contact present between a natural tooth and a fixed prosthesis, or between two fixed prostheses.
3	Functional contact present between a natural tooth or a fixed prosthesis and a removable prosthesis.
4	Functional contact between two removable prostheses.
9	Cannot assess.

Note: A posterior functional contact is classified as present where the contact forms a vertical occlusal stop. This is recorded according to the lower even if the area of contact is small. In rare cases, where there is contact but no occlusal stop (e.g., a scissor bite), a zero is recorded. Clearly, there can be no contact if there is no lower tooth in the zone.

In some cases, it may be difficult to tell whether the teeth actually touch or not. If in doubt, the assumption should be made that the contact is present.

Where there are small spaces in the lower arch and you cannot decide whether you should consider it as a whole zone, count the space as a full zone if the space is wider than half a tooth. Otherwise, ignore it.

Source: National Institute of Dental and Craniofacial Research. Proposal for the Oral Health Examination in the National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC, 2001.

Anterior Functional Contacts

For the anterior region, the examiner evaluates the six lower anterior teeth and counts how many of them are in contact with the upper teeth, irrespective of whether the teeth are natural or fixed prostheses. No special equipment or instruments are required to evaluate this region. Afterward, a score ranging from 0 to 6 is recorded. If a deep overbite exists and it is difficult to see if contact exists, it is assumed that there is contact present. In the case of missing lower teeth or an anterior open bite, there is no contact present. Removable prostheses contacts are not scored.

Established Modifications N/A

Federal Survey Modifications N/A

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Geriatric Oral Health Assessment Index

Procedure & Method Information

Name of Procedure/Method Geriatric Oral Health Assessment Index

Abbreviation GOHAI

Purpose To assess self-perceived impact of oral diseases among the geriatric population.

Year of Establishment 1990

Type of Procedure/Method

Developer(s) K.A. Atchison and T.A. Dolan

Oral Condition Category

Background Information

Background Information

In 1990, due to the lack of valid, reliable, and comprehensive oral health assessment instruments designed for the geriatric population, K.A. Atchison and T.A. Dolan developed the Geriatric Oral Health Assessment Index, also known as GOHAI (Atchison and Dolan, 1990). The GOHAI is a 12-item self-report assessment designed to evaluate the oral health problems of older adults. Each item response is based on a 6-point Likert scale (i.e., always, very often, often, sometimes, seldom, and never).

The GOHAI can be used with individuals or population groups. It provides valuable information pertaining to oral symptoms and associated psychosocial and functional problems that are bothersome to the individual and that may indicate when a comprehensive oral exam or dental referral is needed (Atchison and Dolan, 1990). As well, it can be a beneficial and cost-effective instrument for obtaining information about oral health problems for epidemiological surveys and studies.

Changes Over Time None

Procedure Method

Procedure Method

The GOHAI is administered by a trained health care professional (e.g., dentist, geriatrician) in person or by telephone. For each question, the respondent is asked to estimate the frequency of oral health problems based on a 6-point Likert scale.

For item numbers 1, 2, 4, 6, 8, 9, 10, 11, and 12, the 6-point Likert scale is "always" (code =1),"very often" (code = 2), "often" (code = 3), "sometimes" (code = 4), "seldom" (code = 5), and "never" (code = 6). However, for the remaining items (i.e., 3, 5, and 7), the 6-point Likert scale is the reverse, so that a low value indicates an oral health problem.

After administering the GOHAI, the response codes are summed to obtain the GOHAI score. A high score indicates good oral health and low score indicates poor oral health.

Geriatric Oral Health Assessment Index (GOHAI)

1. How often did you limit the kinds or amounts of food you eat because of problems with your teeth or dentures?
2. How often did you have trouble biting or chewing any kinds of food, such as firm meat or apples?
3. How often were you able to swallow comfortably?
4. How often have your teeth or dentures prevented you from speaking the way you wanted?
5. How often were you able to eat anything without feeling discomfort?
6. How often did you limit contact with people because of the condition of your teeth or dentures?
7. How often were you pleased or happy with the looks of your teeth and gums, or dentures?
8. How often did you use medication to relieve pain or discomfort from around your mouth?
9. How often were you worried or concerned about the problems with your teeth, gums, or dentures?
10. How often did you feel nervous or self-conscious because of problems with your teeth, gums, or dentures?
11. How often did you feel uncomfortable eating in front of people because of problems with your teeth dentures?
12. How often were your teeth or gums sensitive to hot, cold, or sweets?

Source: Atchison KA, Dolan TA. Development of the Geriatric Oral Health Assessment Index. J Dent Educ. 1990 Nov;54(11):680-7.

Established Modifications

None

Federal Survey Modifications

None

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Dolan TA, Peek CW, Stuck AE, Beck JC. Three-year changes in global oral health rating by elderly dentate adults. Community Dent Oral Epidemiol. 1998 Feb;26(1):62-9.

Gingival Bleeding and Loss of Attachment Procedures in the Health and Nutrition Examination Surveys (HANES)

Procedure & Method Information

Name of Procedure/Method Gingival Bleeding and Loss of Attachment Procedures in the Health and Nutrition Examination Surveys (HANES)

Abbreviation N/A

Purpose To assess the prevalence of gingival bleeding and loss of periodontal attachment.

Year of Establishment N/A

Type of Procedure/Method

Developer(s) National Center for Health Statistics (NCHS), United States

Oral Condition Category

Background Information

Background Information

In the National Health and Nutrition Examination Survey (NHANES) I, 1970-1974, and the Hispanic Health and Nutrition Examination Survey (HHANES), the periodontal disease assessment was conducted by the Periodontal Index (PI) developed by A.L. Russell in 1967. For more information on this procedure, please refer to the Periodontal Index.

For NHANES III, 1988-1994, and NHANES IV, 1998-2004, the Periodontal Index (PI) was not used, in part because the PI grades pockets 3 millimeters (mm) or more equally, scores gingivitis and periodontitis on the same scale, and does not measure loss of periodontal attachment (Burt and Eklund, 1999). For these surveys, the procedures for gingival bleeding and loss of attachment were formulated by borrowing from the established historical indices (i.e., the Gingival Index and the Periodontal Disease Index) developed by H. Loe and J. Silness, and S.P. Ramfjord, respectively.

NHANES III and IV used partial-mouth measurements in their assessment of periodontal disease. NHANES III used partial-mouth measurements in both its gingival bleeding and loss of attachment assessments, whereas in NHANES IV, partial-mouth measurements were used in just the loss of attachment assessment. The loss of attachment procedure was the same procedure used in the National Institute of Dental Research (NIDR) National Survey of Employed Adults and Seniors, 1985-1986. This procedure was criticized for measuring periodontitis because it was thought the use of partial-mouth measurements (i.e., two quadrants) would underestimate the true prevalence due to the site specificity of periodontitis and the exclusion of measuring the lingual surface (Burt and Eklund, 1999). However, the use of partial-mouth measurements is believed to be practical for survey use since it saves time and money, but it is not believed to be recommended for clinical trials, or any other situation that demands a high degree of precision in the data (Burt and Eklund, 1999).

Changes Over Time N/A

Procedure Method

Procedure Method

Periodontal Disease Examination: Gingival Bleeding and Loss of Attachment Assessments

For NHANES III, 1988-1994, and NHANES IV, 1998-2004, the sequence of the periodontal disease examination begins with the gingival bleeding assessment and then the periodontal destruction or loss of attachment assessment. Both assessments start with the upper or maxillary quadrant and end with the lower or mandibular quadrant and are conducted from the posterior to the anterior, beginning with the most distal tooth in the quadrant and proceeding toward the midline. Only fully erupted permanent teeth, excluding third molars, are examined and scored/measured.

Except for the gingival bleeding assessment in NHANES IV, as stated earlier, both surveys utilized partial-mouth measurements or two randomly selected quadrants, NHANES III for both the gingival bleeding and loss of attachment assessments and NHANES IV for just the loss of attachment assessment.

Randomly selected quadrants were identified by computer program and based on the SP's (i.e., sample person's) identification number. The fifth digit of the SP's identification number represented the upper quadrant, and the sixth digit represented the lower quadrant. If the number was even, the right side was selected, and if the number was odd, the left side was selected. For example, if the SP's identification number was 067127, "2," the fifth digit, would indicate the upper right quadrant, and "7," the sixth digit, would indicate the lower left quadrant for the periodontal disease exam. Random selection of quadrants was only done once. Therefore, in NHANES III, the quadrants that were examined for the gingival bleeding assessment are the same quadrants examined for the loss of attachment assessment.

Gingival Bleeding Assessment:

For the gingival bleeding assessment, the teeth are air dried first on the buccal/facial surface before examining each quadrant. As stated previously, this assessment begins with the upper quadrant and ends in the lower quadrant, starting with the tooth (i.e., second molar) most distal in the quadrant and continuing toward the midline or the central incisor within the same quadrant. Again, only fully erupted permanent teeth are scored, and third molars are not evaluated. Unlike NHANES III, all four quadrants were examined in NHANES IV in the following order: upper right, upper left, lower left, and lower right.

Within each quadrant, each tooth is examined at the midbuccal/facial and mesiobuccal/facial sites by inserting a periodontal probe no more than 2 mm into the gingival sulcus or pocket, starting slightly distal to the midbuccal/facial site and moving gently over into the mesial interproximal area (i.e., mesiobuccal/facial site). After the quadrant is examined with the periodontal probe, gingival bleeding is scored.

In NHANES III, scores were assigned to each tooth site (i.e., the midbuccal/facial and mesiobuccal/facial sites). If a tooth was missing, partially erupted, or deciduous, a "Y" was indicated for "Cannot be assessed." If the entire quadrant could not be scored, then "NS" for "no score" was recorded. The scoring for the gingival bleeding assessment in NHANES III is as follows:

Gingival Bleeding Assessment Scoring - NHANES III, 1988-1994

0 = No bleeding
1 = Bleeding
Y = Cannot be assessed

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey III, 1988-1994. Washington, DC: U.S. Government Printing Office.

However, in NHANES IV, the scores were assigned by quadrant. In addition, if all teeth in a quadrant were missing, partially erupted, or deciduous, a "9" for "Cannot be assessed" was recorded for that quadrant. The scoring for the gingival bleeding assessment in NHANES IV is as follows:

Gingival Bleeding Assessment Scoring - NHANES IV, 1998-2004

1 = Gingival bleeding detected
2 = No evidence of gingival bleeding
9 = Cannot be assessed

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.

Loss of Attachment Assessment:

Once the two randomly selected quadrants are determined, each tooth from the buccal aspects is air-dried and examined with a surface reflecting mirror and a periodontal probe that is color-coded and graduated at 2, 4, 6, 8, 10, and 12 mm. The probe is used to measure two sites, the midbuccal/facial (B) and the mesiobuccal/facial (M), for each tooth.

Two measurements are taken for each site. The first measurement is the distance from the free gingival margin (FGM) to the cementoenamel junction (CEJ), and the second measurement is the distance from the FGM to the bottom of the sulcus or pocket. Each measurement is rounded to the lowest whole millimeter.

The periodontal probe is held gently, noted as not to exceed a pressure of 25 gram in NHANES III, and inserted toward the apex of the tooth from the buccal/facial aspect to measure both sites, "B" and "M." In addition, for the "M" site, it is suggested that the probe be kept parallel to the long axis of the tooth. Furthermore, for upper and lower molars, it is recommended that buccal/facial evaluation be made at the midpoint of the mesial root. Other special considerations detailed in NHANES III and IV are noted:

Special Considerations

1. Calculus at mesiofacial or midfacial sites that obscures the CEJ or interferes with the correct placement of the probe is removed using a scaler, noted in NHANES III, or curette, if necessary, in NHANES IV.

2. When the margin of a restoration is below the CEJ, the position of the CEJ will be estimated using adjacent landmarks and dental anatomy.

3. When the CEJ cannot be estimated, the examiner will code "Y" to exclude the site.

4. When the natural tooth is missing (i.e., space maintainers, implants, partial denture, or pontics), the tooth sites are scored "Y."

5. Mobile teeth should be examined with care. The CEJ should be estimated if possible.

6. Orthodontically banded teeth, splinted teeth, and hemisected teeth will be considered on an individual basis and should be examined if possible.

7. Partially erupted teeth are excluded from all periodontal assessments. Retained roots are also excluded if the CEJ and part of the clinical crown are not present. The code of "Y" should be used for mesiofacial and midfacial sites of the excluded tooth. If the entire quadrant cannot be scored, the single code of "NS" (no score) should be called.

Note: Extract from the National Center for Health Statistics. National Health and Nutrition Examination Survey III, 1988-1994. Washington, DC: U.S. Government Printing Office; National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.

Established Modifications See above Procedure Method.

Federal Survey Modifications See above Procedure Method.

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Validaty

Reliability

Listing of Publications with Surveys &

Surveys & Studies United States Surveys & Studies:

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Gingival Index

Procedure & Method Information

Name of Procedure/Method Gingival Index

Abbreviation GI

Purpose To assess the prevalence and severity of gingivitis.

Year of Establishment 1963

Type of Procedure/Method

Developer(s) H. Loe and J. Silness

Oral Condition Category

Background Information

Background Information

The Gingival Index (GI) was developed by H. Loe and J. Silness in 1963 to assess the severity and prevalence of gingivitis by examining only the qualitative changes (i.e., severity of the lesion) of the gingival soft tissue. The GI does not take into account periodontal pocket depth, degrees of bone loss, or any other quantitative change of the periodontium (Loe, 1967).

The GI is one of the most widely accepted and used gingival bleeding indices due to its documented validity, reliability, and ease of use. However, even though the GI has demonstrated sufficient sensitivity to distinguish between groups with mild and severe gingivitis, it may not discriminate as well between the middle ranges (Burt and Eklund, 1999).

It can be used on all surfaces for the entire mouth or selected teeth (Burt and Eklund, 1999) or selected areas of all or selected teeth (Loe, 1967). It also can be used on large population groups or an individual.

Changes Over Time None

Procedure Method

Procedure Method

To obtain the GI, the examiner first will need sufficient lighting, a mouth mirror, and probe. The teeth and gingiva (gums) also should be dried lightly with a blast of air and/or cotton rolls.

The buccal, lingual, mesial, and distal surface areas of six teeth are examined and scored according to the following criteria and scoring system (Loe and Silness, 1963). The six teeth that are evaluated are the upper right first molar, the upper right lateral incisor, the upper left first bicuspid, the lower left first molar, the lower left lateral incisor, and the lower right first bicuspid.

To calculate the GI for an individual, each of the four gingival areas (i.e., buccal, lingual, mesial, and distal) of the tooth is given a score from 0 to 3 as described in the following criteria (Loe and Silness, 1963). Then, the four scores from the gingival area are added and divided by 4 to give the GI for the tooth. Afterwards, the GI for the teeth are added and divided by the number of teeth examined (i.e., 6). In addition, the scores for the individual teeth (i.e., incisors, premolars, and molars) may be grouped to designate the GI for groups of teeth.

Criteria and Scoring for the Gingival Index (GI) (Loe and Silness, 1963)

0 = Absence of inflammation.
1 = Mild inflammation - slight change in color and little change in texture.
2 = Moderate inflammation - moderate glazing, redness, oedema, and hypertrophy. Bleeding on pressure.
3 = Severe inflammation - marked redness and hypertrophy. Tendency to spontaneous bleeding. Ulceration.

Source: Loe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. Acta Ondont Scand. 1963; 21:533-51.

Mild inflammation usually occurs from 0.1 to 1.0, where moderate inflammation occurs from 1.1 to 2.0, and severe inflammation scores between 2.1 and 3.0 (Loe and Silness, 1963; Loe, 1967).

Established Modifications

In 1967, Loe detailed the sequence of the examination procedure and slightly modified the procedure to include the entire dentition instead of six teeth (Marks et al., 1993). This detailed exam is as follows:

Using gentle probing pressure, the examination of all erupted teeth typically starts with the upper right second molar and continues over the midline to the upper left second molar. For teeth on the right side of the midline, the exam sequence is distal, buccal/labial, and mesial. On the left side, the exam sequence is mesial, buccal/labial, and distal. When the three surfaces (i.e., distal, buccal/labial, mesial) of all teeth have been scored, the lingual surfaces of all the upper or maxillary teeth are examined beginning with the upper left second molar.

For the lower or mandibular arch, the exam begins with the lower left second molar through to the right second molar. On the left side of the midline, the exam sequence is distal, buccal/labial, and mesial, and on the right side it is mesial, buccal/labial, and distal. Afterwards, all lingual surfaces are scored beginning with the left second molar.

However, according to research, analyses show no difference in the results when only one of the interproximal surfaces for a tooth is examined instead of both, although the score for the one interproximal surface was doubled to allow for the second interproximal surface and the total score for the tooth was divided by 4 (Loe, 1967).

Third molars or wisdom teeth are not examined or scored in the upper or lower arch. According to the developers, the scoring for the GI takes approximately 2 to 5 minutes under optimal conditions and with chair-side assistance.

The calculation for the GI of an individual remained the same except the maximum number of teeth examined in the denominator is 28 instead of 6.

Criteria and Scoring for the Gingival Index (GI)   (Loe, 1967)

0 = Normal gingiva.
1 = Mild inflammation - slight change in color, slight edema. No bleeding on probing.
2 = Moderate inflammation - redness, edema, and glazing. Bleeding on probing.
3 = Severe inflammation - marked redness and edema. Ulceration. Tendency to spontaneous bleeding.

Source: Loe H. The Gingival Index, the Plaque Index, and the Retention Index Systems. J Periodontol, part II, 1967; 38(Suppl):610-6.

In 1983, I.B. Lamster, M.C. Alfano, M.C. Seiger, and J.M. Gordon introduced further modifications to the Gingival Index by changing the ordinal scoring system and the invasive examination procedure to a noninvasive approach. This modified version of the Gingival Index was recommended by Lobene in 1986 due to its increased sensitivity in the low region of the scoring scale and the elimination of the "bleeding on pressure" component (Lobene, 1986; Lobene, Mankodi, Ciancio, Lamm, Charles, and Ross, 1989). For more information, see the Modified Gingival Index.

Federal Survey Modifications

None

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Handicapping Labio-Lingual Deviations Index

Procedure & Method Information

Name of Procedure/Method Handicapping Labio-Lingual Deviations Index *Abbreviation* HLD

Purpose To assess the presence or absence and the degree of physically handicapping orthodontic conditions.

Year of Establishment 1960 *Type of Procedure/Method*

Developer(s) H.L. Draker *Oral Condition Category*

Background Information

Background Information

The Handicapping Labio-Lingual Deviations (HLD) Index was introduced by H.L. Draker in 1960 to identify the presence or absence and the degree of the physical dento-facial handicap based on seven components, and not to diagnose malocclusion (Draker, 1960). These seven components are cleft palate, traumatic deviation, overjet, overbite including reverse overbite, mandibular protrusion, open bite, and labio-lingual spread.

The HLD Index received considerable public health use in the 1960s and 1970s for assessing treatment needs when a public orthodontic program was initiated by the state of New York (Burt and Eklund, 1999). Today, with modifications, the HLD Index has also been adopted by a number of states such as California and Maryland to determine eligibility for public (i.e., Medicaid and Champus) funding of orthodontic treatment (Parker, 1998; Han and Davidson, 2001). For further information on published modifications, please refer to "Established Modifications" under "Procedure Method."

The HLD Index is considered to be a simple, objective, valid, and reliable index that can be applied to both patients and diagnostic study models without the need for special equipment (Draker, 1960; Younis, Vig, Rinchuse, and Weyant, 1997).

Changes Over Time

Besides the modifications referred to above, there have been no changes to the HLD Index established in 1960. However, during the initial development and testing, the HLD Index included two additional components, ectopic eruptions and anterior crowding. But, it was suggested that the labio-lingual spread was the more objective and intended measure so these two components were dropped (Draker, 1960). In addition, as illustrated in the score sheet below, the components of the HLD Index were initially weighted. However, it was felt that a weighting scale of greater accuracy could be obtained via statistical calculations, so the measurements were recorded unweighted and the score sheet was abandoned (Draker, 1960).

Score Sheet

PRINT

Patient's name:
Examiner:
Recorder:

Conditions Observed

1. Cleft palate
Score 15 __________

2. Severe traumatic deviations
Score 15 __________

3. Overjet in mm.
____

4. Overbite in mm.
____

5. Mandibular protrusion in mm.
x5 __________

6. Open bite in mm.
x4 __________

7. Ectopic eruption, anterior only, each tooth
x3 __________

8. Anterior crowding: maxilla: ___ mandible: ___
Score 5 ea. __________

9. Labio-lingual spread in mm.
____

TOTAL HLD SCORE __________

A SCORE OF 13 (tentative) and over constitutes a PHYSICAL HANDICAP.

Source: Draker HL. Handicapping Labio-Lingual Deviations: A proposed index for public health purposes. Am J Orthodontics 1960;46:295-305.

Procedure Method

Procedure Method

To determine the HLD Index, the teeth are positioned in centric occlusion. A Boley gauge scaled in millimeters (mm) is used by a trained examiner for all measurements (i.e., overjet, overbite including reverse overbite, mandibular protrusion, open bite, and labio-lingual spread), and each measurement is rounded off to the nearest millimeter.

The overjet measurement applies to a protruding single tooth, as well as the whole dental arch. For the overbite measurement, it is recommended that a pencil be used to mark the tooth indicating the extent of overlap to facilitate the measurement. The mandibular protrusion is measured from the labial surface of the lower incisor to the labial surface of the upper incisor. The open bite (i.e., absence of occlusal contact in the anterior region) is measured from edge to edge, and it is advised the open bite be estimated for cases of pronounced protrusion when the measurement is not possible. For the labio-lingual spread, the measurement is made from the incisal edge of the mandibular left cuspid to the incisal edge of the lingually locked lateral incisor. When there is a protruded or lingually displaced anterior, the measurement is made from the incisal edge of that tooth to the normal arch line (Draker, 1960). In instances of multiple anterior crowding, all deviations from the normal arch should be measured for the labio-lingual spread; however, only the most severe measurement should be recorded for the HLD Index.

For an individual HDL Index, the examiner records whether each of the seven conditions--cleft palate, traumatic deviation, overjet, overbite including reverse overbite, mandibular protrusion, open bite, and labio-lingual spread--is present or absent, whether the dentition is mixed, and the clinical decision (i.e., approval or disapproval). The codes for the HLD Index are as follows:

0 = Condition absent
X = Condition present
M = Mixed dentition (to be indicated if present)
A = Clinical approval
D = Clinical disapproval

Source: Draker HL. Handicapping Labio-Lingual Deviations: A proposed index for public health purposes. Am J Orthodontics 1960;46:295-305.

In screenings or epidemiological surveys, it is essential that two teams or operators be used, one for the measurements and the other for the clinical decision. It is also required that the clinical teams/operators record their decisions independently and apart from the team/operator that takes the HLD Index measurements (Draker, 1960).

Established Modifications

Modifications to the HLD Index include the California Modification of the Handicapping Labio-Lingual Deviations [HLD(CalMod)] Index and the Maryland Modification of the Handicapping Labio-Lingual Deviations [HLD(Md)] Index.

In 1998, the HLD(CalMod) Index was established due several lawsuits brought against the state of California on the issue of providing orthodontic treatment to persons with medically necessary handicapping malocclusions. The HLD(CalMod) Index incorporates the presence or absence of two additional conditions, a deep impinging overbite when the lower incisors are destroying the soft tissue of the palate and the crossbite of individual anterior teeth when the destruction of soft tissue is present. In addition, the presence or absence of an overjet greater than 9 mm or a reverse overjet greater than 3.5 mm was added. A unilateral posterior crossbite involving two or more adjacent teeth in which one must be a molar was also included as a weighted condition. It also reinstated the inclusion and weighting of ectopic eruption and anterior crowding and the usage of the score sheet as utilized during the development and testing of the original HLD Index.

The HLD(CalMod) Index requires a Boley gauge or disposable ruler and is administered to persons at least 13 years of age. For further information on the HLD(CalMod) Index, please refer to the following score sheet, scoring instructions, and guidelines.

California Modification Handicapping Labio-Lingual Deviations [HLD(CalMod)] Index

Provider: Patient:

Number: SSAN:

Procedure:

- Position the patient's teeth in centric occlusion.
- Record all measurements in the order given and round off to the nearest millimeter (mm).
- ENTER SCORE "0" IF CONDITION IS ABSENT.
- If anterior crowding and an ectopic eruption are present in the anterior portion of the mouth, score only the most severe condition.
- The use of a recorder (hygienist, assistant) is recommended.

Conditions:

1. Cleft palate deformities (Indicate an "X" if present and score no further)

____

2. Deep impinging overbite WHEN LOWER INCISORS ARE DESTROYING THE SOFT TISSUE OF THE PALATE (Indicate an "X" if present and score no further)

____

3. Crossbite of individual anterior teeth WHEN DESTRUCTION OF SOFT TISSUE IS PRESENT (Indicate an "X" if present and score no further)

____

4. Severe traumatic deviations (Attach description of condition. For example, loss of a premaxilla segment by burns or by accident; the result of osteomyelitis; or other gross pathology.) (Indicate an "X" if present and score no further)

____

5A. Overjet greater than 9 mm with incompetent lips or reverse overjet greater than 3.5 mm with reported masticatory and speech difficulties (Indicate an "X" if present and score no further) If reverse overjet is not greater than 3.5 mm, score under #7.

____

5B. Overjet in mm

____

6. Overbite in mm, including reverse overbite

____
7. Mandibular protrusion in mm

x5

____
8. Open bite in mm

x4

____

IF BOTH ANTERIOR CROWDING AND ECTOPIC ERUPTION ARE PRESENT IN THE ANTERIOR PORTION OF THE MOUTH, SCORE ONLY THE MOST SEVERE CONDITION. DO NOT SCORE BOTH CONDITIONS.

9. Ectopic eruption: Count each tooth, excluding 3rd molars

x3

____

10. Anterior crowding: Score one point for MAXILLA and/or one point for MANDIBLE; two points maximum for anterior crowding. Arch length insufficiency must exceed 3.5 mm. Mild rotations that may react favorably to stripping or mild expansion are not to be scored as crowded.

x5

____
11. Labio-lingual spread in mm.

____

12. Posterior unilateral crossbite (must involve two or more adjacent teeth, one of which must be a molar)

Score 4

____

TOTAL HLD(CalMod) SCORE

____

IF A BENEFICIARY DOES NOT SCORE 26 OR ABOVE, HE/SHE MAY BE ELIGIBLE UNDER THE EPSDT EXCEPTION, IF MEDICAL NECESSITY IS DOCUMENTED.

____
__

EPSDT EXCEPTION: Indicate with an "X" and attach medical evidence and appropriate documentation for each of the following eight areas:

a) Principal diagnosis and significant associated diagnosis; and
b) Prognosis; and
c) Date of onset of the illness or condition, etiology if known; and
d) Clinical significance or functional impairment caused by the illness or condition; and
e) Specific types of services to be rendered by each discipline associated with the total treatment plan; and

f) The therapeutic goals to be achieved by each discipline, and anticipated time for achievement of goals; and
g) The extent to which health care services have been previously provided to address the illness or condition, and
results demonstrated by prior care; and
h) Any other documentation available which may assist the Department in making the required determinations.

Source: Parker WS. The HLD (CalMod) index and the index question. Am J Orthod Dentofacial Orthop. 1998 Aug;114(2):134-41.

HLD(CalMod) Index Guidelines

1. In cases with deep impinging bites with tissue destruction, the lower teeth must be clearly touching the palate and
show tissue indentation(s) on the study models or other evidence of soft tissue destruction visible on the study
models.
2. Either of the upper central incisors is to be used when measuring overjet, overbite including reverse overbite,
mandibular protrusion, and open bite. The upper lateral incisors or upper canines may not be used for these
measurements.
3. Dental ectopia include ectopic eruption such as when a portion of the distal root of the primary second molar is
resorbed during the eruption of the first molar. These include transposed teeth. Also included are teeth in the
maxillary sinus, in the ascending ramus of the mandible and other such situations, when teeth develop in other
locations, rather than in the dental arches. These are classic textbook examples of ectopic eruption and
development of teeth.

In all other situations, teeth to be deemed ectopic must be more than 50% blocked out and clearly out of the
dental arch. Regarding mutually blocked out teeth, only one will be counted.

Source: Parker WS. The HLD (CalMod) index and the index question. Am J Orthod Dentofacial Orthop. 1998 Aug;114(2):134-41.

The HLD(Md) Index is very similar to the original HLD Index; however, the scoring cutoff for constituting a handicap was raised from 13 to 15 points and the scoring formulas were modified by subtracting 2 mm from the overjet measurement and 3 mm from the overbite measurement.

Maryland Modification of the Handicapping Labio-Lingual Deviations [HLD(Md)] Index

1. Cleft palate (15) - Score no further if present

Score 15

____

2. Severe traumatic deviations (15) - Score no further if present

Score 15

____

3. Overjet in mm (Subtract 2 from measurement in mm)

____

4. Overbite in mm (Subtract 3 from measurement in mm)

____

5. Mandibular protrusion in mm

x5

____

6. Open bite in mm

x4

____

7. Ectopic eruption, each tooth (If anterior crowding is also present, score only the most severe condition. Do not score both conditions.)

x3

____

8. Anterior crowding: maxilla: ___ mandible: ___ (5 points for each arch when crowding exceeds 3.5 mm. If ectopic condition is also present, score only the most severe condition. Do not score both conditions.)

Score 5 ea.

____

9. Labio-lingual spread in mm (Measurement in mm of the distance from the most protruded to the lingually displaced anterior teeth. If there is only a protruded or lingually displaced tooth, measurement is taken from the incisor edge of that tooth to the normal arch line.)

____

TOTAL HLD(Md) SCORE

____

A SCORE OF 15 and over constitutes a PHYSICAL HANDICAP.

Source: Han H, Davidson WM. A useful insight into 2 occlusal indexes: HLD(Md) and HLD(CalMod). Am J Orthod Dentofacial Orthop. 2001 Sep;120(3):247-53.

Federal Survey Modifications

None

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Handicapping Malocclusion Assessment Record

Procedure & Method Information

Name of Procedure/Method Handicapping Malocclusion Assessment Record

Abbreviation HMAR

Purpose To assess the presence and severity of handicapping malocclusions.

Year of Establishment 1968

Type of Procedure/Method

Developer(s) J.A. Salzmann and the American Association of Orthodontists (AAO) Council on Orthodontic Public Health Service

Oral Condition Category

Background Information

Background Information

In 1968, the Handicapping Malocclusion Assessment Record (HMAR) was introduced by its developers, the American Association of Orthodontists (AAO) Council on Orthodontic Public Health Service under the chairmanship of J.A. Salzmann (Allen, 1970), to assess the presence and severity of a handicapping malocclusion for establishing the priority of treatment.

The HMAR, previously referred to as the Salzmann Index, the AAO (i.e., American Association of Orthodontists) Index, and the Salzmann-AAO Index, has one distinct advantage over the other assessments of malocclusion in that it does not require measuring (i.e., millimeter measurements). Therefore, the HMAR is very beneficial for large-scale surveys, although, it was not designed to determine the presence of occlusal deviations ordinarily included in epidemiological surveys of malocclusion or for clinical orthodontic examinations. Etiology, diagnosis, planning and complexity of treatment, and prognosis are also factors that are not considered for the HMAR (Salzmann, 1967; Salzmann, 1968).

Changes Over Time None

Procedure Method

Procedure Method

The HMAR assesses two deviations, the intra-arch deviation and the inter-arch deviation. Assessments can be made directly from the mouth or from study models or casts. To avoid being influenced by factors not pertinent to the HMAR (e.g., etiology, treatment planning, and other professional value judgments), it is advised not to spend an excessive amount of time examining. Scoring is based on the first impression. It is also highly recommended that a copy of the HMAR form be referenced when performing this procedure.

Summary of Scoring/Weighting System

The assessor scores 2 points for each deviated maxillary incisor (i.e., centrals and laterals) and 2 points for each visible crest of the interdental papilla of spaced maxillary incisors from canine to canine. 1 point is scored for each deviated mandibular incisor, each visible crest of the interdental papilla from canine to canine when the mandibular incisors are spaced, and all posterior teeth (i.e., maxillary and mandibular) affected. For posterior teeth, 1 point is also scored for each spaced tooth (not papilla) when both the crests of the mesial and distal interdental papillae are visible. Posterior teeth include the canines, first and second bicuspids or premolars, and the first molars. Second molars may be assessed when the first molars are missing; otherwise, they are not included for the HMAR.

Intra-Arch Deviation Assessment

The assessment is conducted by placing the study model, teeth upward, in direct view of the assessor. When the assessment is made directly from the mouth, a mouth mirror is used. Using the scoring system above, a value of 2 points is scored for each tooth affected in the maxilla and 1 point in the mandible for the anterior segment, and a value of 1 point is scored for each tooth affected in the posterior segment for the following: missing, crowded, rotated, open spacing, and closed spacing.

Missing

Anterior and posterior teeth are scored by actual count. Unerupted teeth, severely carious nonfunctioning teeth, or teeth with only the roots remaining are recorded as missing.

Crowded

For anterior and posterior teeth, it refers to the positional irregularities of the tooth crowns that interrupt the continuity of the arc of the dental arch, and the space is insufficient for tooth alignment without moving the adjacent teeth in the same arch. Teeth recorded as crowded are not recorded as rotated.

Rotated

For anterior teeth, it refers to positional irregularities of tooth crowns that interrupt the continuity of the arc of the dental arch, but there is sufficient space for tooth alignment without the necessity of moving adjacent teeth in the arch. For posterior teeth, it refers to irregularities of tooth crowns that interrupt the continuity of the arc of the dental arch; all or part of the lingual or buccal surface faces some part of the adjacent proximal tooth surfaces; there is sufficient space for tooth alignment without moving adjacent or other teeth in the arch.

Teeth recorded as rotated are not also recorded as crowded.

Open Spacing

For anterior teeth, it refers to incisor tooth separation that exposes to view the crest of the interdental papillae. Record number of papillae visible from mesial of canine to mesial of canine (not the teeth). For posterior teeth, it refers to interproximal tooth separation that exposes to view the crests of the adjacent mesial and distal interdental papillae of a tooth.

Record the number of posterior teeth affected, not the papillae.

Closed Spacing

For anterior and posterior teeth, it refers to space closure that will not permit a partially erupted tooth to complete its eruption without moving adjacent or other teeth in the same arch. A tooth recorded as showing closed spacing is not recorded also as rotated or crowded. A missing or unerupted tooth with closed spacing is recorded only as missing.

Source: Salzmann JA. Handicapping malocclusion assessment to establish treatment priority. Am J Orthod. 1968 Oct;54(10):749-65.

Once the number of anterior and posterior teeth affected in the maxilla and the mandible are scored separately on the HMAR form, the four subscores (i.e., anterior maxilla score, posterior maxilla score, anterior mandible score, and the posterior mandible score) are added to compute the total intra-arch deviation assessment score.

Inter-Arch Deviation Assessment

Study models are approximated in terminal occlusion, and each side assessed is held in direct view. When the assessment is made in the mouth, terminal occlusion is obtained by bending the head backward as far as possible while keeping the mouth wide open. The tongue is curved upward and backward on the palate, and the teeth are quickly brought into terminal occlusion before the head is brought again into normal position (Salzmann, 1967; Salzmann, 1968). A mouth mirror is also used for the direct mouth observations.

For the inter-arch deviation, the anterior segment and the posterior segment are assessed, recorded, and scored separately using the scoring/weighting system above. For the anterior segment, overjet, overbite, crossbite, and openbite are evaluated. Overbite is the only evaluation that includes scoring for maxillary or mandibular incisors. The other assessments (i.e., overjet, crossbite, and openbite) include scoring for only the maxillary teeth affected. For the posterior segment, crossbite, openbite, and the anteroposterior deviation of posterior teeth are assessed. Afterward, a total score is calculated for both the anterior and posterior segments.

Overjet

Refers to labial position or labio-axial inclination of the maxillary incisors in relation to the mandibular incisors, permitting the latter to occlude on or over the palatal mucosa.

Overbite

Refers to the occlusion of the maxillary incisors on or opposite the labial gingival mucosa of the mandibular incisors, or the mandibular incisors occlude directly on the palatal mucosa back of the maxillary incisors.

Overjet and overbite are scored when the mandibular teeth occlude directly on the palatal mucosa while the maxillary incisor crowns are labially inclined and in overjet. In these instances, both overjet and overbite are scored for the same case.

Crossbite

For maxillary incisors, it refers to the lingual relation with the opposing teeth in the mandible when the maxillary and mandibular dental arches are in terminal occlusion. For posterior teeth, it refers to teeth in the buccal segment that are positioned lingually or buccally out of entire occlusal contact with the teeth in the opposing jaw when the rest of the teeth in the dental arches are in terminal occlusion. When anteroposterior deviation is present in addition to crossbite, both are scored.

Openbite

For incisors, it refers to vertical interarch dental separation between the maxillary and mandibular incisors when the posterior teeth are in occlusion. Openbite is recorded in addition to overjet if the incisal edges of the labially protruding maxillary incisors are above the incisal edges of the mandibular incisors when the posterior teeth are in terminal occlusion.
Edge-to-edge occlusion is not assessed as openbite.

For posterior teeth, it refers to the vertical interdental separation between upper and lower canines, premolars, and first molars when the rest of the teeth in the dental arches are terminal occlusion. Cusp-to-cusp occlusion is not assessed as openbite. When openbite is present with anteroposterior deviation or crossbite, both are scored.

Anteroposterior Deviation

Refers to the occlusion in a forward or rearward direction to the accepted normal relation of the mandibular canine, first and second premolars, and first molar in relation to the opposing maxillary teeth. The deviation is recorded when it extends a full cusp or more for the first molars and when the premolars and canines occlude in the interproximal area mesial or distal to the accepted normal relation. One point is scored for each deviated tooth.

Source: Salzmann JA. Handicapping malocclusion assessment to establish treatment priority. Am J Orthod. 1968 Oct;54(10):749-65.

For the HMAR grand total, the three scores (i.e., the intra-arch total score, the inter-arch anterior segment total score, and the inter-arch posterior segment total score) are totaled. When the intra- and inter-arch maxillary incisor score is 6 points or more, an additional 8 points are added to the HMAR grand total score to denote the presence of an esthetic handicap. For large-scale surveys or screening programs, a cut-off point may be set at a designated score so that those whose scores were above the HMAR cut-off point can be treated when resources (e.g., budgetary funding, personnel) for orthodontics are limited.

For direct mouth assessments, an additional form, the Supplementary Oral Assesement Record, may also be completed for six dentofacial deviations: (1) facial and oral clefts, (2) lower lip palatal to maxillary incisors, (3) occlusal interference, (4) functional jaw limitation, (5) facial asymmetry, and (6) speech impairment. Eight points are scored for each dentofacial deviation. There is also a section for indicating treatment desirability.

Established Modifications None

Federal Survey Modifications	None

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Index of Orthodontic Treatment Needs

Procedure & Method Information

Name of Procedure/Method Index of Orthodontic Treatment Needs

Abbreviation IOTN

Purpose To assess orthodontic treatment need.

Year of Establishment 1989

Type of Procedure/Method

Developer(s) P.H. Brook and W.C. Shaw

Oral Condition Category

Background Information

Background Information

The Index of Orthodontic Treatment Needs (IOTN) was first described in 1989 by P.H. Brook and W.C. Shaw to assess orthodontic treatment need from an anatomical and aesthetic perspective. The IOTN consists of two components, the functional and dental health component (DHC) and the aesthetic component (AC).

The DHC is a modification of a treatment priority index used by the Swedish Public Dental Health System and represents the biological or anatomical aspects of the IOTN. The DHC is categorized into five different grades ranging from grade 1, representing "no need" for treatment, to grade 5, representing a "very great need" of orthodontic treatment based on the evaluation of five occlusal traits: (1) missing teeth, (2) overjet, (3) crossbites, (4) contact point displacement, and (5) overbite.

A Standardized Continuum of Aesthetic Need (SCAN) Scale was used for the development of the aesthetic component. The AC is a visual 10-point scale, illustrated by a series of 10 dental photographs, from 0.5 (i.e., attractive dental appearance) to 5.0 (i.e., unattractive dental appearance). The individual's rating is an indication of treatment need in terms of aesthetic impairment and by inference reflects the sociopsychological need for orthodontic treatment.

The IOTN, which was developed in Great Britain and predominantly used in Europe, is considered to be a valid and reliable index. For use in epidemiological surveys, the IOTN is thought to be a simple, quick, and satisfactory reproducible method for recording orthodontic treatment need (Brook and Shaw, 1989; Tang and Wei, 1993; Beglin, Firestone, Vig, Beck, Kuthy, and Wade, 2001).

Changes Over Time

The original IOTN is still in use. However, a suggestion to reduce the dental health and aesthetic components to three grades and a 3-point scale, respectively, was approved and is currently being used as the British standard for orthodontic treatment (Lunn, Richmond, and Mitropoulos, 1993; Jenny and Cons, 1996). For more information, please refer to "Established Modifications," under Procedure Method.

Procedure Method

Procedure Method

The procedural methods for the components (i.e., the DHC and AC) of the IOTN vary. For the DHC, the measurements can be made directly from the mouth or from study models/casts. When applied to study casts, it should be noted that there are minor differences in the definition of some traits (Shaw, Richmond, O'Brien, Brook, and Stephens, 1991). With adequate lighting, a millimeter ruler, and mouth mirror, the DHC occlusal traits (e.g., overjet, crossbite, overbite) are measured or assessed. See the DHC of the IOTN below. The order in which these occlusal traits are assessed is not important. Afterward, the grading assigned is based on the most severe trait indicating the priority or need for treatment. Summing scores for the series of occlusal traits is not done.

For the AC, 10 front view photographs illustrating varying degrees of dental occlusion and/or attractiveness are presented in a horizontal arrangement from 0.5 (i.e., attractive dental appearance) on the extreme left to 5.0 (i.e., unattractive dental appearance) on the extreme right. For direct mouth assessments, self-retaining lip/cheek retractors are used. However, for study casts, the occlusion is examined from the front, and the appearance of the dentition is judged as it would be seen in normal day-to-day interaction (Shaw, Richmond, O'Brien, Brook, and Stephens, 1991). The AC rating is based on matching the patient's dental appearance with one of the photographs and is allocated for overall dental attractiveness rather than specific morphological similarity to the photographs (Shaw, Richmond, O'Brien, Brook, and Stephens, 1991; McGuinness and Stephens, 1994). This component may either be rated in the normative manner by the health care professional (e.g., orthodontist) or by the patient for a self-perceived determination of orthodontic treatment need.

Each component is mutually exclusive, and the component showing the greatest need takes priority (Beglin, Firestone, Vig, Beck, Kuthy, and Wade, 2001).

Index of Orthodontic Treatment Need (IOTN)

Dental Health Component (DHC)

Grade 5 - Very Great
  Defects of cleft lip and/or palate.
  Increased overjet greater than 9 mm.
  Reverse overjet greater than 3.5 mm with reported masticatory or speech difficulties.
  Impeded eruption of teeth (with the exception of third molars) due to crowding, displacement, the presence of
  supernumerary teeth, retained deciduous teeth and any other pathological cause.
  Extensive hypodontia with restorative implications (more than one tooth missing in any quadrant) requiring pre-
  restorative orthodontics.

Grade 4 - Great
  Increased overjet greater than 6 mm but less than or equal to 9 mm.
  Reverse overjet greater than 3.5 mm with no reported masticatory or speech difficulties.
  Reverse overjet greater than 1 mm but less than or equal to 3.5 mm with reported masticatory

or speech
difficulties.
Anterior or posterior crossbites with greater than 2 mm displacement between retruded contact position and
intercuspal position.
Posterior lingual crossbites with no occlusal contact in one or both buccal segments.
Severe displacement of teeth greater than 4 mm.
Extreme lateral or anterior open bite greater than 4 mm.
Increased and complete overbite causing notable indentations on the palate or labial gingivae.
Patient referred by colleague for collaborative care, e.g., periodontal, restorative, or TMJ considerations.
Less extensive hypodontia requiring pre-restorative orthodontics or orthodontic space closure to obviate the need
for a prosthesis (not more than 1 tooth missing in any quadrant).

Grade 3 - Moderate
Increased overjet greater than 3.5 mm but less than or equal to 6 mm with incompetent lips at rest.
Reverse overjet greater than 1 mm but less than or equal to 3.5 mm.
Increased and complete overbite with gingival contact but without indentations or signs of trauma.
Anterior or posterior crossbite with less than or equal to 2 mm but greater than 1 mm displacement between
retruded contact position and intercuspal position.
Moderate lateral or anterior open bite greater than 2 mm but less than or equal to 4 mm.
Moderate displacement of teeth greater than 2 mm but less than or equal to 4 mm.

Grade 2 - Little
Increased overjet greater than 3.5 mm but less than or equal to 6 mm with lips competent at rest.
Reverse overjet greater than 0 mm but less than or equal to 1 mm.
Increased overbite greater than 3.5 mm with no gingival contact.
Anterior or posterior crossbite with less than or equal to 1 mm displacement between retruded contact position and
intercuspal position.
Small lateral or anterior open bites greater than 1 mm but less than or equal to 2 mm.
Pre-normal or post-normal occlusions with no other anomalies.
Mild displacement of teeth greater than 1 mm but less than or equal to 2 mm.

Grade 1 - None
Other variations in occlusion including displacement less than or equal to 1 mm.

Aesthetic Component (AC)
0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
(attractive dental appearance) (unattractive dental appearance)

Source: Brook PH, Shaw WC. The development of an index of orthodontic treatment priority. Eur J Orthod. 1989 Aug;11(3):309-20.

Established Modifications

A major modification of the DHC and the AC was suggested in 1993 to improve the reliability of both components (Lunn, Richmond, and Mitropoulos, 1993; Jenny and Cons, 1996). For the DHC, the suggestion was to reduce the five grades to three grades, with grades 1 and 2 indicating "no need" for treatment; grade 3, "borderline need"; and grades 4 and 5, "definite need." The suggestion for the AC was to change the 10-point scale to a 3-point scale, with photographs 1 to 4 representing "no need," photographs 5 to 7 representing "borderline need," and photographs 8 to 10 representing "definite need" for treatment based on aesthetics. These suggested modifications were accepted by the IOTN specialist team in Manchester, England, and currently are used as the British standards for orthodontic treatment (Jenny and Cons, 1996).

The aesthetic component of the IOTN was also modified into a tactile graphics version for visually impaired orthodontic patients (AlSarheed, Bedi, and Hunt, 2000). Another modified version of the IOTN was also introduced in 2001 for establishing priorities for treatment in oral health surveys (Burden, Pine, and Burnside, 2001). For this modification, the DHC was reduced to 2 grades (i.e., 0 = no definite need, and 1 = definite need) by combining grades "borderline need" and "no need" into one category grade (i.e., 0 = no definite need). For the AC, the 10-point scale is still utilized as in the original IOTN. However, for this modified IOTN, only those malocclusions with a definite dental health need and aesthetic need for treatment (i.e., AC photographs 8, 9, and 10) are recorded. A small metal ruler was also developed to assist with the intraoral measurements of overjet, crowding, and open bites and is considered much simpler to understand and use than the original DHC ruler (Burden, Pine, and Burnside, 2001).

Modified DHC of the IOTN (Burden, Pine, and Burnside, 2001)

If any one of the occlusal anomalies below is present, there is a definite need for orthodontic treatment. The acronym "MOCDO" is used as an aide memoire: Missing teeth, Overjet, Crossbites, Displacement of contact points (crowding), and Overbite.

M Hypodontia requiring pre-restorative orthodontics or orthodontic space closure to obviate the need for
prosthesis.

Impeded eruption of teeth. Presence of supernumerary teeth and retained deciduous teeth.

O Increased overjet greater than 6 mm.

Reverse overjet greater than 3.5 mm with no masticatory or speech difficulties.

Reverse overjet greater than 1 mm but less than 3.5 mm with recorded masticatory and speech difficulties.

C Anterior or posterior crossbites with greater than 2 mm discrepancy between retruded contact position and
intercuspal position.

D Contact point displacements greater than 4 mm.

O Lateral or anterior open bites greater than 4 mm.

Deep overbite with gingival or palatal trauma.

Source: Burden DJ, Pine CM, Burnside G. Modified IOTN: an orthodontic treatment need index for use in oral health surveys. Community Dent Oral Epidemiol. 2001 Jun;29(3):220-5.

Federal Survey Modifications

None

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International Classification of Diseases for Oncology

Procedure & Method Information

Name of Procedure/Method International Classification of Diseases for Oncology *Abbreviation* ICD-O

Purpose To classify and code neoplasms by topography (i.e., site) and morphology (i.e., histology).

Year of Establishment 1976 *Type of Procedure/Method*

Developer(s) World Health Organization (WHO) *Oral Condition Category*

Background Information

Background Information The first edition of the International Classification of Diseases for Oncology (ICD-O) to classify and code neoplasms by topography (i.e., site) and morphology (i.e., histology) was introduced in 1976 by the World Health Organization (WHO).

Prior to the development of the ICD-O, the classification of neoplasms (i.e., tumors) was based primarily on topography and behavior (e.g., malignant, benign, and in situ), which is still the principal system utilized today in the International Classification of Diseases (ICD) series. However, for several years, cancer specialists (i.e., oncologists) realized that knowledge solely of topography was not sufficient for planning treatment or conducting research, so a system including morphology was desired (Fritz, 2000).

In the ICD (e.g., ICD-9 or ICD-10), the topography code is based on the behavior of the neoplasm in terms of five different categories: malignant, secondary or metastatic, in situ, benign, uncertain and unknown. There are very few histological types identified in the ICD. For example, in the ICD, there is no way to distinguish between an adenocarcinoma and a squamous cell carcinoma of the lung, which are both coded as malignant (Fritz, 2000). Whereas in the ICD-O, the topography or site code, using the same three- or four-character code as malignant neoplasms in the ICD, remains the same for all neoplasms of that site; and a behavior code is included as the fifth digit of the morphology field for classifying neoplasms as malignant, benign, in situ, and so forth.

Changes Over Time In the third edition of ICD-O (ICD-O-3), the morphology code for neoplasms has been revised, especially for lymphomas and leukemias.

Procedure Method

Procedure Method The ICD-O is a dual classification and coding system for both topography and morphology. A complete ICD-O code consists of 10 digits or characters (e.g., C00.0 M-8070/31) to identify the topographical site (4 characters), morphological type (4 digits), behavior (1 digit), and grade/differentiation of a neoplasm or its equivalent in leukemias and lymphomas (1 digit).

Structure of Topography Code   Structure of Morphology Code

C ___ ___.___   M___ ___ ___ ___ / ___ ___

site subsite   histology behavior grade

Example: C00.0   M-8070/3 1

lip, external upper lip   squamous cell, carcinoma well-differentiated

Diagnostic term: Well-differentiated squamous cell carcinoma, external upper lip

(i.e., C00.0 M-8070/31)

ICD-O: 5th Digit Behavior Code for Neoplasms

Code
/0 Benign
/1 Uncertain whether benign or malignant
 Borderline malignancy
 Low malignant potential
 Uncertain malignant potential
/2 Carcinoma in situ
 Intraepithelial
 Noninfiltrating
 Noninvasive
/3 Malignant, primary site
/6* Malignant, metastatic site
 Malignant, secondary site
/9* Malignant, uncertain whether primary or metastatic site

* Not used by cancer registries.

Source: Fritz AG (ed). International classification of diseases for oncology: ICD-O, 3rd ed. Geneva: World Health Organization, 2000.

ICD-O: 6th Digit Code for Histologic Grading and Differentiation

Code
1 Grade I
 Well differentiated
 Differentiated, NOS*
2 Grade II

		Moderately differentiated
		Moderately well differentiated
		Intermediate differentiation
3	Grade III	
		Poorly differentiated
4	Grade IV	
		Undifferentiated
		Anaplastic
9		Grade or differentiation not determined, not stated, or not applicable

*NOS - Not Otherwise Specified

Source: Fritz AG (ed). International classification of diseases for oncology: ICD-O, 3rd ed. Geneva: World Health Organization, 2000.

ICD-O: 6th Digit Code for Immunophenotype Designation for Lymphomas and Leukemias

Code	
5	T-cell
6	B-cell
	Pre-B
	B-precursor
7	Null cell
	Non T-non B
8	NK cell
	Natural killer cell
9	Cell type not determined, not stated, or not applicable

Source: Fritz AG (ed). International classification of diseases for oncology: ICD-O, 3rd ed. Geneva: World Health Organization, 2000.

Established Modifications

The International Classification of Childhood Cancer (ICCC) is based on the second edition of the International Classification of Diseases for Oncology (ICD-O-2).

Federal Survey Modifications

None

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Validaty

Reliability

Surveys & Studies

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Irregularity Index

Procedure & Method Information

Name of Procedure/Method Irregularity Index

Abbreviation None

Purpose To assess anterior mandibular malocclusion (i.e., crowding).

Year of Establishment 1975

Type of Procedure/Method

Developer(s) R.M. Little

Oral Condition Category

Background Information

Background Information

In 1975, the Irregularity Index was described by R.M. Little to assess anterior mandibular crowding by determining the linear displacement of the adjacent anatomic contact points of six mandibular incisors (i.e., the centrals, laterals, and cuspids [canines]).

The index is considered a simple, clinically reliable, and valid index but not without error (Little, 1975). According to the developer, the major problem with the Irregularity Index is the tendency to exaggerate cases with considerable irregularity but with little arch length shortage. Furthermore, the index does not allow for several factors that must be considered when assessing and formulating a comprehensive diagnosis such as the subject's cephalometric pattern, facial esthetics, age, tooth morphology, and the effect of habit correction (Little, 1975).

Changes Over Time None

Procedure Method

Procedure Method

The Irregularity Index is determined by measuring directly from the subject's mandibular cast. The trained examiner uses a caliper, calibrated to at least the nearest tenth of a millimeter, that is held parallel to the occlusal plane to measure. The linear displacement of the adjacent anatomic contact points of the six mandibular incisors (i.e., the centrals, laterals, and cuspids) is measured. Then, the five measurements are summed to compute the Irregularity Index value.

Established Modifications None

Federal Survey Modifications

For the National Health and Nutrition Examination Survey (NHANES) III, 1988-1994, the Irregularity Index was used as the basis for the incisor alignment procedure. Unlike the Irregularity Index developed by Little, the NHANES III incisor alignment procedure measures the linear displacement of the anatomic contact points in both the maxilla and the mandible.

The incisor alignment procedure was included as a component of the Treatment Priority Index (TPI) that was modified in NHANES III. For more information on the incisor alignment procedure, please refer to the "Federal Survey Modifications" section for the TPI.

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Validaty

Reliability

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Loss of Periodontal Attachment

Procedure & Method Information

Name of Procedure/Method Loss of Periodontal Attachment

Abbreviation LPA

Purpose To assess loss of attachment or periodontitis.

Year of Establishment 1959

Type of Procedure/Method

Developer(s) S.P. Ramfjord

Oral Condition Category

Background Information

Background Information

The procedure for determining loss of periodontal attachment (LPA) was originally developed in 1959 by S.P. Ramfjord for the Periodontal Disease Index (PDI). Although the PDI is rarely used today, Ramfjord's indirect method for measuring LPA is still in use (Burt and Eklund, 1999).

The indirect method of measuring LPA is generally considered the best available measure of periodontitis in epidemiology. However, the LPA records the scars of past disease rather than present disease activity. Therefore, it is recommended that the clinical LPA measures be combined with some measure (e.g., cytokines) of current disease activity (Burt and Eklund, 1999).

In contrast, the validity of attachment loss as an indicator of periodontal disease was assessed by comparing clinical estimates to measurements of actual attachment levels made in vitro after extraction of the same teeth. The differences between the clinical and the actual measurements averaged less than 0.4 mm (Carlos, Wolfe, and Kingman, 1986; Clerehugh and Lennon, 1984).

Changes Over Time None

Procedure Method

Procedure Method

To measure loss of periodontal attachment (LPA), follow Ramfjord's technique as outlined below.

If the gingival margin is on enamel:

1. Measure from gum margin to cementum-enamel junction (CEJ) and record the measurement on the crown of the schematic tooth. If the epithelial attachment is on the crown and

cementum-enamel junction cannot be felt by the probe, record the depth of the gingival crevice on the crown.

2. Measure from the gingival margin to the bottom of the pocket when the crevice extends apically to the cementum-enamel junction, the measurement should be recorded on the root of the schematic tooth. (The distance from the cementum-enamel junction to the bottom of the pocket can then be found by subtracting measurement number 1 from measurement number 2.)

If the gingival margin is on the cementum:

1. Measure from the cementum-enamel junction to the gingival margin. Record as minus value on the root of the schematic tooth.

2. Measure from the cementum-enamel junction to the bottom of the gingival crevice. Record value on the root.

Source: Ramfjord SP. Indices for prevalence and incidence of periodontal disease. J Periodontol. 1959;30:51-9.

Measuring LPA is carried out on at least two to six sites per tooth for selected teeth or for the whole dentition, depending on the purpose of the study. An examination measuring six sites per tooth for an entire and intact dentition can last approximately 30 to 40 minutes per exam, even for an experienced examiner (Burt and Eklund, 1999).

Established Modifications None

Federal Survey Modifications None

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Medical Outcomes Study Questionnaires

Procedure & Method Information

Name of Procedure/Method Medical Outcomes Study Questionnaires

Abbreviation MOS

Purpose To assess general health status.

Year of Establishment 1986-1992

Type of Procedure/Method

Developer(s) A.R. Tarlov, J. E. Ware, Jr., K.B. Wells, A.L. Stewart, C.D. Sherbourne, R.D. Hays, W.H. Rogers, S. Greenfield, and S.H. Berry

Oral Condition Category

Background Information

Background Information

The Medical Outcomes Study (MOS) was a large-scale observational study of variations in physician practice styles and patient medical outcomes in different health care delivery systems. The patients surveyed had treatable chronic disease conditions, mainly heart disease, hypertension, diabetes, and depression. The MOS contained two assessment components, a cross-sectional and longitudinal. The cross-sectional component evaluated the impact of chronic disease conditions on patient's well-being and medical care received, and the longitudinal component assessed changes in health conditions and outcomes in terms of care, provider specialty, style of practice, and other factors that influence health care utilization (Sociometrics, 2001). The MOS utilized a variety of assessment instruments including the 20-item Short Form Health Survey (SF-20) for the cross-sectional component and the 36-item Short Form Health Survey (SF-36) for the longitudinal component.

The SF-20 is a very brief health status instrument that evaluates six health concepts: physical functioning (6 items), role functioning (2 items), social functioning (1 item), mental health (5 items), current general health perceptions (5 items), and bodily pain (1 item). Even though its usage is documented very little, especially in comparison with the SF-36, the analyses of the MOS cross-sectional data provided strong support for the reliability and construct validity of the SF-20 (Hays, Sherbourne, and Mazel, 1993).

The SF-36 developed by J.E. Ware, Jr., C.D. Sherbourne, R.D. Hays, A. Stewart, S. Berry, and B. Gandek is a 36-item instrument, derived from the 149-item Functioning and Well-Being Profile (FWBP), for measuring self-perceived general health status and outcomes (Stewart and Ware, 1992). The items for the SF-36 were selected because they had the strongest associations with the long-form scales (Slade, 1997) and were thought to be an improvement over the SF-20 items (Coons, Rao, Keininger, and Hays, 2000).

The SF-36 is constructed of eight scales that each aggregate 2 to 10 items. These eight health concepts or scales are limitations in physical activities due to health problems (Physical

Functioning - PF), limitations in usual role activities due to physical health problems (Role-Physical - RP), body pain (Bodily Pain - BP), general health perceptions (General Health - GH), energy and fatigue (Vitality - VT), limitations in social activities due to physical or emotional problems (Social Functioning - SF), limitations in usual role activities due to emotional problems (Role-Emotional - RE), and psychological distress and well-being (Mental Health - MH). These eight health concepts were chosen from the 40 concepts included in the MOS to represent concepts hypothesized to be most frequently measured in widely used health surveys and most affected by disease and treatment (Ware and Sherbourne, 1992; Ware and Gandek, 1998; SF-36.com, 2001).

These eight scales are arranged in terms of their factor content (i.e., construct validity) and are also combined to contribute to two summary measures, the Physical Component Summary (PCS) and the Mental Component Summary (MCS). The physical functioning, role-physical, and bodily pain scales correlate highly and contribute mostly to the scoring of the PCS, whereas the mental health, role-emotional, and social functioning scales mostly correlate and contribute to the scoring for the MCS. The three scales that correlate with both the physical and mental components are vitality, general health, and social functioning (SF-36.com, 2001).

The SF-36 is designed for patients at all stages of disease, from completely well to those with symptoms. It has been successfully administered to general populations as well as young and older adults with specific disease ailments. The SF-36 is a simple generic instrument that takes approximately 5 to 10 minutes to complete. The SF-36 has been extensively field tested in terms of its validity (i.e., content, concurrent, criterion, construct, and predictive), reliability (i.e., internal consistency and test-retest), and responsiveness and is well regarded (Doyle, 1998). Since the SF-36 is relatively short and not time-consuming, it can also be inserted within questionnaires with more precise general and/or specific measures. However, when combining the SF-36 with other measures in the same questionnaire, it is recommended the SF-36 come first, to be consistent with standard SF-36 data collection (Ware and Gandek, 1998; SF-36.com, 2001).

The SF-36 is one of the most widely used and recognized health-related quality of life instruments in the world. It has been translated into more than 40 languages, documented in more than 2,000 publications, and used in clinical practice settings and a variety of studies such as general population surveys, clinical trials, outcomes research studies, and health policy evaluations.

Changes Over Time

Besides the several modifications (i.e., questionnaire versions) available, there have been no changes over time to the original SF-20 and SF-36. For more information on these questionnaire versions, please refer to "Established Modifications" under Procedure Method.

Procedure Method

Procedure Method

The SF-36 can be self-administered, administered by a trained interviewer in-person or by telephone, or computer-administered to persons aged 14 years and older. It is not advised to be used with children.

When scoring, a score is computed for each of the eight scales: physical functioning, role-physical, bodily pain, general health perceptions, vitality, social functioning, role-emotional, and mental health. All but one of the 36 items, the self-reported health transition item, is used to score the eight scales. Each item is used in scoring only one scale. A scale score is calculated by adding all of the responses for items within that scale. It is not necessary to standardize or weight items within a scale.

Each scale is then transformed to a 0 to 100 scale using a transformation formula to facilitate interpretation. This transformation converts the lowest and the highest possible scores to 0 and 100, respectively, allowing scores in between 0 and 100 to represent the percentage of the total possible score achieved. This conversion allows for scale results to be compared with general population norms.

For obtaining summary scores, the scale scores designated for each summary measure (i.e., PCS and MCS) are combined and calculated. Summary scores are recommended for use when there is a need to limit the number of outcomes being analyzed or when a general effect across the subscales in the physical or mental component is expected (SF-36.com, 2001). There is no one overall score calculated for the SF-36.

Established Modifications

Established modifications to the original SF-36 include the RAND 36-item Health Survey 1.0 (RAND-36), the SF-36 acute version, and a recent SF-36 Version 2.0 (SF-36v2).

The RAND-36 is exactly the same as the original SF-36 in regard to content. However, the RAND-36 uses different scoring algorithms for two of the eight scales, bodily pain and general health. So, the scoring results for these scales are not comparable with the original SF-36. According to research, the RAND scoring is rarely used because the standard or the original SF-36 is readily available and because studies have demonstrated that the RAND-36 scoring does not meet scaling and scoring assumptions as well as the standard SF-36 scoring in the U.S. or other countries (SF-36.com, 2001).

RAND 36-item Health Survey 1.0 (RAND-36)

1. In general, would you say your health is: (GH)

   Excellent (1)
   Very Good (2)
   Good (3)
   Fair (4)
   Poor (5)

2. Compared to one year ago, how would you rate your health in general now? (HT)

   Much better now than one year ago (1)
   Somewhat better now than one year ago (2)
   About the same (3)
   Somewhat worse now than one year ago (4)
   Much worse now than one year ago (5)

The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much? (1) Yes, limited a lot (2) Yes, limited a little (3) No, not limited at all

3. Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports (PF)
4. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf (PF)
5. Lifting or carrying groceries (PF)
6. Climbing several flights of stairs (PF)
7. Climbing one flight of stairs (PF)
8. Bending, kneeling, or stooping (PF)
9. Walking more than a mile (PF)
10. Walking several blocks (PF)
11. Walking one block (PF)
12. Bathing or dressing yourself (PF)

During the past 4 weeks, have you had any of the following problems with work or other regular daily activities as a result of physical health? (1) Yes (2) No

13. Cut down the amount of time you spent on work or other activities (RP)
14. Accomplished less than you would like (RP)
15. Were limited in the kind of work or other activities (RP)
16. Had difficulty performing the work or other activities (for example, it took extra effort) (RP)

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)? (1) Yes (2) No

17. Cut down the amount of time you spent on work or other activities (RE)
18. Accomplished less than you would like (RE)
19. Didn't do work or other activities as carefully as usual (RE)

20. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your
normal social activities with family, friends, neighbours, or groups? (SF)

Not at all (1)
Slightly (2)
Moderately (3)
Quite a bit (4)
Extremely (5)

21. How much bodily pain have you had during the past 4 weeks? (BP)

None (1)
Very mild (2)
Mild (3)
Moderate (4)
Severe (5)

Very severe (6)

22. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the
home and housework)? (BP)

Not at all (1)
A little bit (2)
Moderately (3)
Quite a bit (4)
Extremely (5)

These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling. (1) All of the time (2) Most of the time (3) A good bit of the time (4) Some of the time (5) A little of the time (6) None of the time

How much of the time during the past 4 weeks ……

23. Did you feel full of pep? (VT)
24. Have you been a very nervous person? (MH)
25. Have you felt so down in the dumps that nothing could cheer you up? (MH)
26. Have you felt calm and peaceful? (MH)
27. Did you have a lot of energy? (VT)
28. Have you felt downhearted and blue? (MH)
29. Did you feel worn out? (VT)
30. Have you been a happy person? (MH)
31. Did you feel tired? (VT)

32. During the past 4 weeks, how much of the time has physical health or emotional problems interfered with your
social activities (like visiting with friends, relatives, etc.)? (SF)

All of the time (1)
Most of the time (2)
Some of the time (3)
A little of the time (4)
None of the time (5)

How TRUE or FALSE is each of the following statements for you. (1) Definitely true (2) Mostly true (3) Don't know (4) Mostly false (5) Definitely false

33. I seem to get sick a little easier than other people (GH)
34. I am as healthy as anybody I know (GH)
35. I expect my health to get worse (GH)
36. My health is excellent (GH)

Source: Hays RD, Sherbourne CD, Mazel RM. The RAND 36-Item Health Survey 1.0. Health Econ. 1993 Oct;2(3):217-27.

The acute version of SF-36 uses a 1-week recall period, whereas the standard SF-36 uses a 4-week recall period. This is the only difference between these two versions. The acute version is beneficial in cases when the effects of treatment have a quick turnaround.

The SF-36v2 was developed to improve item wording and scoring and to increase response options for five items in the two role-functioning scales (i.e., role-physical and role-emotional). The SF-36v2 has been field tested in a general population survey and has demonstrated no change in respondent burden (QualityMetric Incorporated, 2001).

In addition, in 1994, a 12-item Short Form Health Survey (SF-12) was developed by J.E. Ware, Jr., to be a shorter, yet valid, alternative to the SF-36 for use in large-scale general and specific population surveys as well as longitudinal studies of health outcomes (Medical Outcomes Trust, 2001). The 12 items of the SF-12 are a subset of the SF-36 items. One to two items are included for each of the eight scales. The SF-12 is a one-page form that takes approximately 2 minutes to administer. Except for the SF-36, the SF-12 is one of the most widely used generic measures of health status. It has been extensively used as a screening tool, translated into more than 40 languages, and frequently imbedded in longer, condition-specific surveys due to its brevity.

The SF-12 has also shown that it can reproduce the SF-36 summary measures (i.e., PCS and MCS) very well in both general and specific populations. However, when examining all eight scales, the SF-36 is recommended more than the SF-12, which achieves less precision for all eight scales (SF-36.com, 2001). Similar to the SF-36, there is also a SF-12 acute version for a 1-week recall period and a SF-12 Version 2.0 (SF-12v2).

Furthermore, there is a new 8-item version of the SF-36, referred to as 8-item Short Form Health Survey (SF-8). It has only eight questionnaire items that each represent one of the eight health concepts or scales in the SF-36. The SF-8 was developed to replace the SF-36 and SF-12 in U.S. and international population health surveys. It is thought to be a major advance in achieving both brevity and comprehensiveness in population health surveys. It was the first SF survey instrument developed on the basis of empirical studies by linking each item to a widely used selection of questionnaire items, including but not limited to the SF-36, proven to assess the same health concept (SF-36.com, 2001; QualityMetric Incorporated, 2001). Each of the eight items and summary measures can be scored (e.g., norm-based) in the same manner as the SF-36. The SF-8 has been translated into more than 30 languages and is available in a standard (i.e., 4-week recall period), an acute (i.e., 1-week recall period), a 24-hour recall period version.

Another documented version is the 6-item Short Form Health Survey (SF-6) that is used as a supplement in "How to Score and Interpret Single-Item Health Status Measures: A Manual for User of the SF-8 Health Survey" (QualityMetric Incorporated, 2001).

In regard to scoring, there is a new norm-based scoring (NBS) for the original and version 2.0 of the SF-36 and SF-12. The NBS simplifies the interpretation and the comparison of results across the eight scales: physical functioning, role-physical, bodily pain, general health perceptions, vitality, social functioning, role-emotional, and mental health. In the standard SF-36, scoring was originally based on a 0 to 100 scale that produced peaks and valleys across the eight scales. This made comparisons between the scales difficult. For example, a score of 80 on the physical functioning scale appears to be equal to a score of 80 on the vitality scale.

However, due to the differences with the means of these scales, a score of 80 on the physical functioning scale is below the norm while a score of 80 on the vitality scale is considerably above the norm for the general U.S. population.

With the norm-based scoring, each scale is standardized to a mean of 50 and a standard deviation of 10 in the general U.S. population, similar to the scoring for the physical component summary (PCS) and the mental component summary (MCS). Therefore, the scoring interpretation is easier because the general population norms for the eight scales no longer have to be remembered. All scores above or below 50 can be interpreted as above or below the general population norm, respectively. It is also easier to understand exactly how far above or below the mean the score is in standard deviation units since the standard deviation is 10 for each scale. In addition, the NBS allows direct comparisons between scores for the original and the new version 2.0.

Federal Survey Modifications

None

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Modified Developmental Defects of Dental Enamel Index

Procedure & Method Information

Name of Procedure/Method Modified Developmental Defects of Dental Enamel Index

Abbreviation Modified DDE

Purpose To assess developmental enamel defects to avoid the need for diagnosising fluorosis before recording enamel opacities.

Year of Establishment 1989

Type of Procedure/Method

Developer(s) J.J. Clarkson and D.M. O'Mullane

Oral Condition Category

Background Information

Background Information

The original Developmental Defects of Dental Enamel (DDE) Index was developed by the Commission on Oral Health, Research and Epidemiology for the Federation Dentaire Internationale (FDI) in 1982 to avoid the need for diagnosing fluorosis before recording enamel opacities. However, with this original DDE Index, the recording, presentation, and interpretation of the data were thought be too time-consuming and difficult (Clarkson and O'Mullane, 1989). So in 1989, the DDE Index was modified by J.J. Clarkson and D.M. O'Mullane.

The modified version of the DDE Index revised the section entailing the "Type of Defect" into three broad categories, demarcated opacities, diffuse opacities, and hypoplastic defects, along with a provision for recording discoloration or any other defects. As a result, it was found that when the defects were grouped primarily into demarcated and diffuse opacities and hypoplastic defects, the examination, recording, and presentation of data were simpler and easier to understand (Clarkson and O'Mullane, 1989). Also, to measure the severity of the defect, the extent of the tooth surface covered by the defect was scored as less than one-third, at least one-third but less than two-thirds, and at least two-thirds. The recording of the extent of defects and the actual division of the tooth surfaces into thirds were found to be reproducible (Clarkson and O'Mullane, 1989).

All definitions for each type of condition were the same as in the original DDE Index, with the addition of the subtype, diffuse confluent opacity, defined as a diffuse opacity in which any patchiness has merged into a regular condensed chalky white area, which could cover the entire surface of a tooth or be confined to a localized area of the tooth surface.

During the development of the Modified DDE Index, the examination of each tooth surface was still deemed too time-consuming, and the additional measure, extent of defect, added to the examination timeframe. So, the Modified DDE Index was refined to be used in one of two manners, one for general purpose epidemiological studies and one for simple screening surveys, so its use would be practical and simple.

Changes Over Time None

Procedure Method

Procedure Method

Depending on the manner in which it is used (i.e., screening or epidemiological surveys), to obtain the Modified DDE Index, the labial/buccal surfaces of eight index permanent teeth, namely, the maxillary centrals and lateral incisors, maxillary first premolars, and mandibular first molars are examined first for enamel defects. For full-mouth examinations, the labial/buccal and lingual surfaces of all erupted permanent teeth except the third molars (i.e., wisdom teeth) are examined. For screening surveys, it is recommended that the index teeth be used. Whereas, when carrying out epidemiological studies requiring both analytical and descriptive approaches, it is recommended that either the index teeth or all the permanent teeth be examined depending on the requirements of the study (Clarkson and O'Mullane, 1989).

In contrast to the ideal recommendation for the original DDE Index, all teeth are examined wet instead of dry. The index teeth should be examined in natural light, whereas for the full-mouth examination a fiberoptic or artificial light source should be used. It is recommended that the age groups to be examined should be standardized. It was found that children aged 8 to 15 years give a range of ages sufficiently wide to determine the prevalence of defects on early and late erupting teeth and changes over time (Clarkson and O'Mullane, 1989).

The coding for the Modified DDE Index in screening surveys and epidemiological studies is as follows:

The Modified DDE Index for Use in Screening Surveys

Normal (Code = 0)
Demarcated opacity (Code = 1)
Diffuse opacity (Code = 2)
Hypoplasia pits (Code = 3)
Other defects (Code = 4)

The Modified DDE Index for Use in General Purpose Epidemiological Studies

Normal (Code = 0)

Demarcated opacity:
- White/cream (Code = 1)
- Yellow/brown (Code = 2)

Diffuse opacity:
- Diffuse lines (Code = 3)
- Diffuse patchy (Code = 4)

- Diffuse confluent (Code = 5)
- Confluent/patchy + staining + loss of enamel (Code = 6)

Hypoplasia:
- Pits (Code = 7)
- Missing enamel (Code = 8)
- Any other defects (Code = 9)

Extent (area of surface affected) of Defect
- Normal (Code = 0)
- Less than 1/3 (Code = 1)
- At least 1/3 and less than 2/3 (Code = 2)
- At least 2/3 (Code = 3)

Source: Clarkson J, O'Mullane D. A modified DDE Index for use in epidemiological studies of enamel defects. J Dent Res. 1989 Mar;68(3):445-50.

For the Modified DDE Index, results are expressed as frequency or percentage distributions, not mean scores.

Established Modifications None

Federal Survey Modifications None

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Validaty

Reliability

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Modified Gingival Index

Procedure & Method Information

Name of Procedure/Method Modified Gingival Index

Abbreviation MGI

Purpose To assess the prevalence and severity of gingivitis.

Year of Establishment 1986

Type of Procedure/Method

Developer(s) R.R. Lobene, T. Weatherford, N.M. Ross, R.A. Lamm, and L. Menaker

Oral Condition Category

Background Information

Background Information

In 1986, the Modified Gingival Index (MGI), a modification of the Loe and Silness Gingival Index, was recommended and officially named by R.R. Lobene, T. Weatherford, N.M. Ross, R.A. Lamm, and L. Menaker to assess the prevalence and severity of gingivitis. According to the review of literature, the evaluation procedure for the MGI appears as far back as 1983 by I.B. Lamster, M.C. Alfano, M.C. Seiger, and J.M. Gordon.

Unlike the Gingival Index, the MGI has a noninvasive approach method, meaning there is no gentle probing to possibly provoke bleeding on pressure, which was one of the main reasons for its development. The other reason for its development was to increase sensitivity in the low region of the scoring scale. For the MGI, determining the severity of gingivitis is strictly based on visual observation, which has maintained a high visual sensitivity, especially with incipient gingivitis (Burt and Eklund, 1999).

Since its development, the MGI has been used widely, especially in clinical trials of therapeutic agents.

Changes Over Time None

Procedure Method

Procedure Method

To obtain the MGI, the labial/facial and lingual surfaces of the gingival margins and the interdental papillae of all erupted teeth or selected teeth (e.g., Ramfjord) are examined and scored using the following criteria. Third molars are excluded. For a full mouth examination with 28 teeth, a maximum number of 108 gingival units (i.e., marginal and papillary) are examined and scored for gingivitis (i.e., 56 marginal and 52 papillary).

Again, for the MGI, the examination of gingivitis is strictly based on visual observation. There is no gentle probing or pressure to observe the presence or absence of bleeding.

Scoring and Criteria for the Modified Gingival Index

0 = Normal (absence of inflammation)
1 = Mild inflammation (slight change in color, little change in texture) of any portion of the gingival unit
2 = Mild inflammation of the entire gingival unit
3 = Moderate inflammation (moderate glazing, redness, edema, and/or hypertrophy) of the gingival unit
4 = Severe inflammation (marked redness and edema/hypertrophy, spontaneous bleeding, or ulceration) of the gingival unit

Source: Lobene RR, Mankodi SM, Ciancio SG, Lamm RA, Charles CH, Ross NM. Correlations among gingival indices: a methodology study. J Periodontol. 1989 Mar;60(3):159-62.

To calculate the MGI for an individual, the papillary and marginal scores are added and divided by the total number of sites (i.e., gingival units) examined.

Established Modifications

None

Federal Survey Modifications

None

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Validaty

Lobene RR, Weatherford T, Ross NM, Lamm RA, Menaker L. A modified gingival index for use in clinical trials. Clin Prev Dent. 1986 Jan-Feb;8(1):3-6.

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Eaton KA, Rimini FM, Zak E, Brookman DJ, Newman HN. The achievement and maintenance of inter-examiner consistency in the assessment of plaque and gingivitis during a multicentre study based in general dental practices. J Clin Periodontol. 1997 Mar;24(3):183-8.

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Modified Sulcular Bleeding Index

Procedure & Method Information

Name of Procedure/Method Modified Sulcular Bleeding Index

Abbreviation mSBI

Purpose To assess the severity of gingival bleeding.

Year of Establishment 1987

Type of Procedure/Method

Developer(s) A. Mombelli, M.A. Van Oosten, E. Schurch, Jr., N.P. Land

Oral Condition Category

Background Information

Background Information

The Modified Sulcular Bleeding Index (mSBI), also known as the Modified Sulcus Bleeding Index, was developed in 1987 by A. Mombelli, M.A. Van Oosten, E. Schurch, Jr., and N.P. Land to determine the severity of gingival bleeding, a sign of inflammation that is associated with periodontal disease.

The mSBI is one of the several modified versions of the Papillary Bleeding Index (PBI) that originated from the PM Index of 1958 (Muhlemann and Mazor, 1958), later named the Sulcus Bleeding Index (Muhlemann and Son, 1971) to avoid confusion with the PMA Index.

Based on the review of literature, there has been very little research utilizing this index or studying its validity and reliability.

Changes Over Time None

Procedure Method

Procedure Method

A periodontal probe is used and passed along the gingival margin to provoke bleeding, and the clinical findings are recorded according to the following scores and criteria.

Scoring and Criteria for the Modified Sulcular Bleeding Index (mSBI)

0 No bleeding when a periodontal probe is passed along the gingival margin.
1 Isolated bleeding spots visible.
2 Blood forms a confluent red line on margin.
3 Heavy or profuse bleeding.

Source: Newbrun E. Indices to measure gingival bleeding. J Periodontol. 1996

Jun;67(6):555-61.

Established Modifications	None
Federal Survey Modifications	None

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Validaty

Reliability

Listing of Publications with Surveys &

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Moyers' Mixed Dentition Analysis

Procedure & Method Information

Name of Procedure/Method Moyers' Mixed Dentition Analysis *Abbreviation* None

Purpose To assess the amount of space available in the dental arch for succeeding permanent teeth and necessary occlusal adjustments.

Year of Establishment 1958 *Type of Procedure/Method*

Developer(s) R.E. Moyers *Oral Condition Category*

Background Information

Background Information The Moyers' Mixed Dentition Analysis was developed by R.E. Moyers in 1958 to determine the amount of space available in the dental arch for succeeding permanent teeth and necessary occlusal adjustments by estimating the sizes of the unerupted permanent cuspids (canines) and premolars (bicuspids) from the sizes of the permanent teeth already erupted in the mouth.

The mandibular incisors (i.e., the centrals and laterals) are used for measuring and/or predicting the size of the upper (maxillary) as well as the lower (mandibular) posterior teeth since the mandibular incisors appear or erupt early in the mouth, are easily measured accurately, and are directly the center of most space management problems (Moyers, 1988). The maxillary incisors are not used for any prediction or estimation procedures due to their variability in size and the low prediction correlation with other groups of teeth (Moyers, 1988).

For the Moyers' Mixed Dentition Analysis, the estimate of the amount of spacing or crowding is only valid the very day the analysis is done, and not two or three years later. The analysis also does not predict the amount of natural decrease in the perimeter that may occur during the transitional period without the loss of teeth (Moyers, 1988).

According to the developer, the Moyers' Mixed Dentition Analysis is recommended because (1) it has minimal systematic error with a range of known errors; (2) it can be conducted with equal reliability by the beginner and expert since it does not presume sophisticated clinical judgment; (3) it is not time-consuming; (4) it requires no special equipment or radiographic projections; (5) it can be done with reasonable accuracy in the mouth, even though it is best done on dental cast; and (6) it may be used for both the maxillary and mandibular dental arches (Moyers, 1988).

Changes Over Time Originally, there were only two probability charts for predicting the sizes of the unerupted cuspids and premolars: one chart for the maxillary (upper) dental arch and the other chart for the mandibular (lower) dental arch (Moyers, 1973). However, now, the probability charts for predicting the sizes of the cuspids and premolars in the maxillary and mandibular arches are updated and based on the sex of the individual (i.e., male or female) (Moyers, 1988). For more information, please see procedure method.

Procedure Method

Procedure Method

For the Moyers' Mixed Dentition Analysis, the procedure may be conducted for both the mandibular arch and the maxillary arch. Remember the mandibular incisors (i.e., the centrals and laterals) are used for the mandibular (lower) arch procedure as well as the maxillary (upper) arch procedure.

Procedure in the Mandibular Arch

1. Measure with a tooth-measuring gauge or a pointed Boley gauge the greatest mesiodistal width of each of the four mandibular incisors and record these values on the Mixed Dentition Analysis form.

2. Determine the amount of space needed for alignment of the incisors. Set the gauge to a value equal to the sum of the widths of the left central incisor and left lateral incisor. Place one point of the gauge at the midline of the alveolar crest between the central incisors and let the other point lie along the line of the dental arch on the left side. Mark on the tooth or the cast the exact point where the distal surface of the lateral incisor will be when it has been aligned. Repeat this process for the right side of the arch. If the cephalometric evaluation shows the mandibular incisor to be too far labially, the gauge tip is placed at the midline but moved lingually a sufficient amount to simulate the expected uprighting of the incisors as dictated by the cephalometric evaluation.

3. Compute the amount of space available after incisor alignment by measuring the distance from the point marked in the line of the arch in Step 2 above to the mesial surface of the first permanent molar. This distance is the space available for the cuspid and the two premolars and for any necessary molar adjustment after the incisors have been aligned. Record the data for both sides on the Mixed Dentition Analysis form.

4. Predict the size of the combined widths of the mandibular cuspid and premolars. The prediction is done by using the probability charts provided below (Note: Probability charts are based on size variations and relationships in teeth of North American whites and may or may not be valid for other ethnic groups). Locate at the top of the mandibular chart the value that most nearly corresponds to the sum of the widths

of the four mandibular incisors. Beneath the figure is a column of figures representing the range of values for all the cuspid and premolar sizes that will be found for incisors of the indicated size. For example, for males with a combined incisor width of 22.0 mm, the summated mandibular cuspid and premolar widths range from 22.6 mm at the 95.0% confidence level to 18.7 mm at the 5.0% level. This means that of all the people (i.e., males) in the universe whose mandibular incisors measure 22.0 mm, 95.0% will have cuspid and premolar widths totaling 22.6 mm or less and only 5.0% will have cuspids and premolars whose widths total as low as 18.7 mm.

The value at the 75.0% level (e.g., 21.4 mm) is chosen as the estimate since it has been determined to be the most practical from a clinical standpoint because it allows for more protection on the down side (i.e., crowding) than on the up side (i.e., spacing). However, for more experienced clinicians, the 50.0% level may be used since it is a more precise estimate that equally distributes any error both ways. Record the estimated value for the combined cuspid and premolar widths on the Mixed Dentition Analysis form for right and left sides, since it is the same for both.

5. Compute the amount of space left in the arch for molar adjustment by subtracting the estimated cuspid and premolar size from the measured space available in the arch after alignment of the incisors. Record these values for each side. A complete assessment of the space in the mandible is now possible from all the values recorded above.

Probability Charts for Predicting the Sizes of Unerupted Cuspids and Premolars (Bicuspids)

A. Mandibular Bicuspids and Cuspids

						Males							
21/12 =	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0	25.5
95.0%	21.6	21.8	22.0	22.2	22.4	22.6	22.8	23.0	23.2	23.5	23.7	23.9	24.2
85.0%	20.8	21.0	21.2	21.4	21.6	21.9	22.1	22.3	22.5	22.7	23.0	23.2	23.4
75.0%	20.4	20.6	20.8	21.0	21.2	21.4	21.6	21.9	22.1	22.3	22.5	22.8	23.0
65.0%	20.0	20.2	20.4	20.6	20.9	21.1	21.3	21.5	21.8	22.0	22.2	22.4	22.7
50.0%	19.5	19.7	20.0	20.2	20.4	20.6	20.9	21.1	21.3	21.5	21.7	22.0	22.2
35.0%	19.0	19.3	19.5	19.7	20.0	20.2	20.4	20.67	20.9	21.1	21.3	21.5	21.7
25.0%	18.7	18.9	19.1	19.4	19.6	19.8	20.1	20.3	20.5	20.7	21.0	21.2	21.4
15.0%	18.2	18.5	18.7	18.9	19.2	19.4	19.6	19.9	20.1	20.3	20.5	20.7	20.9
5.0%	17.5	17.7	18.0	18.2	18.5	18.7	18.9	19.2	19.4	19.6	19.8	20.0	20.2

Females

21/12 =	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0	25.5
95.0%	20.8	21.0	21.2	21.5	21.7	22.0	22.2	22.5	22.7	23.0	23.3	23.6	23.9
85.0%	20.0	20.3	20.5	20.7	21.0	21.2	21.5	21.8	22.0	22.3	22.6	22.8	23.1
75.0%	19.6	19.8	20.1	20.3	20.6	20.8	21.1	21.3	21.6	21.9	22.1	22.4	22.7
65.0%	19.2	19.5	19.7	20.0	20.2	20.5	20.7	21.0	21.3	21.5	21.8	22.1	22.3
50.0%	18.7	19.0	19.2	19.5	19.8	20.0	20.3	20.5	20.8	21.1	21.3	21.6	21.8
35.0%	18.2	18.5	18.8	19.0	19.3	19.6	19.8	20.1	20.3	20.6	20.9	21.1	21.4
25.0%	17.9	18.1	18.4	18.7	19.0	19.2	19.5	19.7	20.0	20.3	20.5	20.8	21.0
15.0%	17.4	17.7	18.0	18.3	18.5	18.8	19.1	19.3	19.6	19.8	20.1	20.3	20.6
5.0%	16.7	17.0	17.2	17.5	17.8	18.1	18.3	18.6	18.9	19.1	19.3	19.6	19.8

Source: Moyers RE. Handbook of Orthodontics, 4th edition. Chicago: Year Book Medical Publishers, 1988.

Procedure in the Maxillary Arch

The procedure for the maxillary arch is similar to the procedure in the mandibular arch, except (1) the maxillary probability chart is used for predicting the upper cuspid and premolar sum and (2) allowance must be made for overjet correction when measuring the space to be occupied by the aligned incisors.

Probability Charts for Predicting the Sizes of Unerupted Cuspids and Premolars (Bicuspids)

B. Maxillary Bicuspids and Cuspids

Males

21/12 =	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0	25.5
95.0%	21.2	21.4	21.6	21.9	22.1	22.3	22.6	22.8	23.1	23.4	23.6	23.9	24.1
85.0%	20.6	20.9	21.1	21.3	21.6	21.8	22.1	22.3	22.6	22.8	23.1	23.3	23.6
75.0%	20.3	20.5	20.8	21.0	21.3	21.5	21.8	22.0	22.3	22.5	22.8	23.0	23.3
65.0%	20.0	20.3	20.5	20.8	21.0	21.3	21.5	21.8	22.0	22.3	22.5	22.8	23.0
50.0%	19.7	19.9	20.2	20.4	20.7	20.9	21.2	21.5	21.7	22.0	22.2	22.5	22.7
35.0%	19.3	19.6	19.9	20.1	20.4	20.6	20.9	21.1	21.4	21.6	21.9	22.1	22.4
25.0%	19.1	19.3	19.6	19.9	20.1	20.4	20.6	20.9	21.1	21.4	21.6	21.9	22.1
15.0%	18.8	19.0	19.3	19.6	19.8	20.1	20.3	20.6	20.8	21.1	21.3	21.6	21.8
5.0%	18.2	18.5	18.8	19.0	19.3	19.6	19.8	20.1	20.3	20.6	20.8	21.0	21.3

Females

21/12 =	19.5	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0	25.5
95.0%	21.4	21.6	21.7	21.8	21.9	22.0	22.2	22.3	22.5	22.6	22.8	22.9	23.1
85.0%	20.8	20.9	21.0	21.1	21.3	21.4	21.5	21.7	21.8	22.0	22.1	22.3	22.4
75.0%	20.4	20.5	20.6	20.8	20.9	21.0	21.2	21.3	21.5	21.6	21.8	21.9	22.1
65.0%	20.1	20.2	20.3	20.5	20.6	20.7	20.9	21.0	21.2	21.3	21.4	21.6	21.7
50.0%	19.6	19.8	19.9	20.1	20.2	20.3	20.5	20.6	20.8	20.9	21.0	21.2	21.3
35.0%	19.2	19.4	19.5	19.7	19.8	19.9	20.1	20.2	20.4	20.5	20.6	20.8	20.9

25.0%	18.9	19.1	19.2	19.4	19.5	19.6	19.8	19.9	20.1	20.2	20.3	20.5	20.6
15.0%	18.5	18.7	18.8	19.0	19.1	19.3	19.4	19.6	19.7	19.8	20.0	20.1	20.2
5.0%	17.8	18.0	18.2	18.3	18.5	18.6	18.8	18.9	19.1	19.2	19.3	19.4	19.5

Source: Moyers RE. Handbook of Orthodontics, 4th edition. Chicago: Year Book Medical Publishers, 1988.

It is also advised that it is good practice to study the radiographs when the Moyers' Mixed Dentition Analysis is done in order to note the absence of permanent teeth, unusual malpositions of development, or the abnormalities of crown formation such as a mandibular second premolar with two lingual cusps (Moyers, 1988). In such instances, the crown is larger than might be expected from the probability chart, so a higher predictive value is used.

Moyers' Mixed Dentition Analysis Form

Total Space Available

Tooth Size

Maxillary Arch

_____|_____|_____|_____|_____|_____||_____|_____|_____|_____|_____|_____ Total: __________ mm

Mandibular Arch

_____|_____|_____|_____|_____|_____||_____|_____|_____|_____|_____|_____ Total: __________ mm

Total Space Required

	Maxilla	Mandible
Incisor widths (measured in mm)	________ mm	________ mm
Width of cuspids and bicuspids (predicted)	________ mm	________ mm
Needed to achieve Class I occlusion of molars (estimated)	+________ mm	-________ mm

		right	left
Estimated possibilities of increasing space available	maxilla:	________ mm	________ mm
	mandible:	________ mm	________ mm

Source: Moyers RE. Handbook of Orthodontics for the Student and General Practitioner, 3rd edition. Chicago: Year Book Medical Publishers, 1973; Moyers RE. Handbook of Orthodontics, 4th edition. Chicago: Year Book Medical Publishers, 1988.

Established Modifications

In Step 4 above for the Moyers' Mixed Dentition Analysis, a shorter but less precise method was developed (Tanaka and Johnston, 1974). It is:

1. Add the widths of the mandibular incisors and divide by two.
2. Add 10.5 mm to the value obtained above to predict the combined widths of the mandibular

cuspid and
premolars and 11.0 mm to predict the combined widths of the maxillary cuspid and premolars. Then, record the
the estimated values for the combined cuspid and premolar widths on the Mixed Dentition Analysis form.

Federal Survey Modifications	None

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Validaty

Reliability

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Oral Health Impact Profile

Procedure & Method Information

Name of Procedure/Method Oral Health Impact Profile

Abbreviation OHIP

Purpose To assess self-perception of the social impact of oral health disorders on well-being.

Year of Establishment 1994

Type of Procedure/Method

Developer(s) G.D. Slade and A.J. Spencer

Oral Condition Category

Background Information

Background Information

Due to the existence of very few health status instruments specific for oral health disorders, in 1994, G.D. Slade and A.J. Spencer introduced the Oral Health Impact Profile (OHIP). The OHIP is a questionnaire that can be used as an index to determine the self-perceived social impact of oral health conditions on well-being and quality of life.

The OHIP, also referred to as OHIP-49, contains seven domains, dimensions or subscales that evaluate different aspects of the impact of oral health disorders on well-being. They are functional limitation, physical discomfort, psychological discomfort, physical disability, psychological disability, social disability, and handicap. In all, there are a total of 49 questions that are numerically weighted to reflect the importance of each statement. These 49 questions along with their weights are listed in the Procedure Method section.

The Oral Health Impact Profile (OHIP) Model

Subscale (no. of questions)

Functional Limitation (9)
Physical Pain (9)
Psychological Discomfort (5)
Physical Disability (9)
Psychological Disability (6)
Social Disability (5)
Handicap (6)

Source: Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. Community Dent Health. 1994 Mar;11(1):3-11.

The OHIP-49 can be self- or interviewer-administered. The average time for interviewer administration is approximately 17 minutes. The short time for response is one reason that it is used as a self-administered questionnaire by some investigators (Slade and Spencer, 1994). According to its developers, the OHIP-49 is not recommended for use with children or individuals with reduced language or cognitive abilities and in settings where detailed data collection is not feasible (Slade and Spencer, 1994).

Furthermore, since development, the OHIP has demonstrated good validity and reliability (Locker and Slade, 1993; Slade and Spencer, 1994; Slade, 1997). It has been used in a number of different epidemiological studies and among different sociodemographic populations (e.g., elderly and minority adolescent populations). The OHIP also has been translated into several languages such as French, German, Tagalog, Somali, Japanese, and Finish.

Changes Over Time None

Procedure Method

Procedure Method

The OHIP-49 can be self- or interviewer-administered as previously stated. Each of the 49 questions contains a Likert scale in which the respondent indicates whether the problem has been experienced "very often" (code = 4), "fairly often" (code = 3), "sometimes" (code = 2), "hardly ever" (code = 1), or "never" (code = 0).

When scoring the OHIP, the response code for each question is multiplied by the weight, indicated in parentheses, and the products are summed within each domain or subscale to compute seven subscale scores. The mean subscale score is calculated by dividing the subscale score by the total number of questions within the domain or subscale. A single OHIP score can also be computed by adding the seven subscale scores.

Oral Health Impact Profile (OHIP-49)

Functional Limitations
1. Have you had difficulty chewing any foods because of problems with your teeth, mouth, or dentures? (1.854)
2. Have you had trouble pronouncing any words because of problems with your teeth, mouth, or dentures? (1.534)
3. Have you noticed a tooth which doesn't look right? (1.106)
4. Have you felt that your appearance has been affected because of problems with your teeth, mouth, or dentures?
(1.568)
5. Have you felt that your breath has been stale because of problems with your teeth, mouth, or dentures? (1.709)
6. Have you felt that your sense of taste has worsened because of problems with your teeth, mouth, or dentures?
(1.379)
7. Have you had food catching in your teeth or dentures? (1.749)
8. Have you felt that your digestion has worsened because of problems with your teeth, mouth, or dentures? (1.729)

9. Have you felt that your dentures have not been fitting properly? (2.179)

Physical Pain

10. Have you had painful aching in your mouth? (1.796)
11. Have you had a sore jaw? (1.387)
12. Have you had headaches because of problems with your teeth, mouth, or dentures? (1.604)
13. Have you had sensitive teeth, for example, due to hot or cold foods or drinks? (1.560)
14. Have you had toothache? (2.015)
15. Have you had painful gums? (1.610)
16. Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth, or dentures? (1.478)
17. Have you had sore spots in your mouth? (1.872)
18. Have you had uncomfortable dentures? (1.484)

Psychological Discomfort

19. Have you been worried by dental problems? (1.650)
20. Have you been self conscious because of your teeth, mouth, or dentures? (1.564)
21. Have dental problems made you miserable? (1.852)
22. Have you felt uncomfortable about the appearance of your teeth, mouth, or dentures? (1.493)
23. Have you felt tense because of problems with your teeth, mouth, or dentures? (1.666)

Physical Disability

24. Has your speech been unclear because of problems with your teeth, mouth, or dentures? (1.641)
25. Have people misunderstood some of your words because of problems with your teeth, mouth, or dentures? (1.645)
26. Have you felt that there has been less flavour in your food because of problems with your teeth, mouth, or dentures? (1.556)
27. Have you been unable to brush your teeth properly because of problems with your teeth, mouth, or dentures? (1.581)
28. Have you had to avoid eating some foods because of problems with your teeth, mouth, or dentures? (1.874)
29. Has your diet been unsatisfactory because of problems with your teeth, mouth, or dentures? (1.514)
30. Have you been unable to eat with your dentures because of problems with them? (2.000)
31. Have you avoided smiling because of problems with your teeth, mouth, or dentures? (1.585)
32. Have you had to interrupt meals because of problems with your teeth, mouth, or dentures? (1.409)

Psychological Disability

33. Has your sleep been interrupted because of problems with your teeth, mouth, or dentures? (1.925)
34. Have you been upset because of problems with your teeth, mouth, or dentures? (1.375)
35. Have you found it difficult to relax because of problems with your teeth, mouth, or

dentures? (1.625)
36. Have you felt depressed because of problems with your teeth, mouth, or dentures? (1.911)
37. Has your concentration been affected because of problems with your teeth, mouth, or dentures? (1.616)
38. Have you been a bit embarrassed because of problems with your teeth, mouth, or dentures? (1.418)

Social Disability
39. Have you avoided going out because of problems with your teeth, mouth, or dentures? (1.293)
40. Have you been less tolerant of your spouse or family because of problems with your teeth, mouth, or dentures?
(2.101)
41. Have you had trouble getting on with other people because of problems with your teeth, mouth, or dentures?
(1.507)
42. Have you been a bit irritable with other people because of problems with your teeth, mouth, or dentures? (1.839)
43. Have you had difficulty doing your usual jobs because of problems with your teeth, mouth, or dentures? (1.484)

Handicap
44. Have you felt that your general health has worsened because of problems with your teeth, mouth, or dentures?
(2.085)
45. Have you suffered any financial loss because of problems with your teeth, mouth, or dentures? (1.402)
46. Have you been unable to enjoy other people's company as much because of problems with your teeth, mouth, or
dentures? (1.525)
47. Have you felt that life in general was less satisfying because of problems with your teeth, mouth, or dentures?
(1.547)
48. Have you been totally unable to function because of problems with your teeth, mouth, or dentures? (1.855)
49. Have you been unable to work to your full capacity because of problems with your teeth, mouth, or dentures?
(1.457)

Source: Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. Community Dent Health. 1994 Mar;11(1):3-11.

Established Modifications

In 1997, G.D. Slade shortened the OHIP-49 into the OHIP-14. The only difference between the two versions is length. As indicated by its name, the OHIP-14 contains only 14 questions that each have a 5-point Likert-type scale (i.e., "very often" [code = 4], "fairly often" [code = 3], "occasionally" [code = 2], "hardly ever" [code = 1], or "never" [code = 0]) in which respondents are asked how frequently they had experienced the impact within the last 12 months. The OHIP-14 along with each question's relevant weight, in parentheses, is indicated below for further information.

Oral Health Impact Profile (OHIP-14)

Functional Limitations
1. Have you had trouble pronouncing any words because of problems with your teeth, mouth, or dentures? (0.51)
2. Have you felt that your sense of taste has worsened because of problems with your teeth, mouth, or dentures?
(0.49)

Physical Pain
3. Have you had painful aching in your mouth? (0.34)
4. Have you found it uncomfortable to eat any foods because of problems with your teeth, mouth, or dentures?
(0.66)

Psychological Discomfort
5. Have you been self conscious because of your teeth, mouth, or dentures? (0.45)
6. Have you felt tense because of problems with your teeth, mouth, or dentures? (0.55)

Physical Disability
7. Has your diet been unsatisfactory because of problems with your teeth, mouth, or dentures? (0.52)
8. Have you had to interrupt meals because of problems with your teeth, mouth, or dentures? (0.48)

Psychological Disability
9. Have you found it difficult to relax because of problems with your teeth, mouth, or dentures? (0.60)
10. Have you been a bit embarrassed because of problems with your teeth, mouth, or dentures? (0.40)

Social Disability
11. Have you been a bit irritable with other people because of problems with your teeth, mouth, or dentures? (0.62)
12. Have you had difficulty doing your usual jobs because of problems with your teeth, mouth, or dentures? (0.38)

Handicap
13. Have you felt that life in general was less satisfying because of problems with your teeth, mouth, or dentures?
(0.59)
14. Have you been totally unable to function because of problems with your teeth, mouth, or dentures? (0.41)

Source: Slade GD. Derivation and validation of a short-form oral health impact profile. Community Dent Oral Epidemiol. 1997 Aug;25(4):284-90.

Federal Survey Modifications None

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Reliability

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Oral Health-Related Quality of Life

Procedure & Method Information

Name of Procedure/Method Oral Health-Related Quality of Life

Abbreviation OHQOL

Purpose To assess the self-perceived impact of oral health conditions on quality of life.

Year of Establishment 1996

Type of Procedure/Method

Developer(s) N. Kressin, A. Spiro III, R. Bosse, R. Garcia, and L. Kazis

Oral Condition Category

Background Information

Background Information

The Oral Health-Related Quality of Life (OHQOL) was established in 1996 by N. Kressin, A. Spiro III, R. Bosse, R. Garcia, and L. Kazis to measure the perceived impact of oral health conditions on daily functioning. The OHQOL is a very quick and simple instrument to use since it only consists of three items or questions. The OHQOL items are based on the three dental-related questions used in the Rand Health Insurance Experiment (HIE). Each item is scored using a 6-point Likert scale ranging from "all of the time" to "none of the time."

A literature review revealed very little information documenting the use of the OHQOL in surveys and studies. However, according to its developers, the OHQOL has demonstrated good construct validity and a high degree of internal consistency during its testing (Kressin, Spiro, Bosse, Garcia, Kazis, 1996; Jones, 1998).

Changes Over Time None

Procedure Method

Procedure Method

The respondent answers each of the following questions based on a 6-point scale ranging from "all of the time" to "none of the time."

Oral Health-Related Quality of Life (OHQOL)

1. Have problems with your teeth or gums affected your daily activities, such as work or hobbies?

2. Have problems with your teeth or gums affected your social activities, such as with family, friends, coworkers?

3. Have problems with your teeth or gums caused you to avoid conversations with people because of how you look?

Source: Kressin N, Spiro A 3rd, Bosse R, Garcia R, Kazis L. Assessing oral health-related quality of life: findings from the normative aging study. Med Care. 1996 May;34(5):416-27.

Established Modifications	None
Federal Survey Modifications	None

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Validaty

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Reliability

Jones JA. Using oral quality of life measures in geriatric dentistry. Community Dent Health. 1998 Mar;15(1):13-8.

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Jones JA, Kressin NR, Spiro A 3rd, Randall CW, Miller DR, Hayes C, Kazis L, Garcia RI. Self-reported and clinical oral health in users of VA health care. J Gerontol A Biol Sci Med Sci. 2001 Jan;56(1):M55-62.

Oral Health-Related Quality of Life Questionnaire in the National Health and Nutrition Examination Survey (NHANES) IV

Procedure & Method Information

Name of Procedure/Method Oral Health-Related Quality of Life Questionnaire in the National Health and Nutrition Examination Survey (NHANES) IV

Abbreviation N/A

Purpose To assess the self-perceived impact of oral health conditions on quality of life.

Year of Establishment N/A

Type of Procedure/Method

Developer(s) National Center for Health Statistics (NCHS), United States

Oral Condition Category

Background Information

Background Information In the National Health and Nutrition Examination Survey (NHANES) IV, 1998-2004, sample persons (SPs) aged 15 years and older will receive the oral health-related quality of life assessment to determine the self-perceived impact of oral health conditions on quality of life. This assessment will consist of a questionnaire composed of seven questions. These seven oral health-related quality of life questions are based on questions that have been extensively tested and described in several scientific publications in addition to demonstrating a high degree of validity and reliability (NIDCR, 2001).

Changes Over Time N/A

Procedure Method

Procedure Method In NHANES IV, prior to the oral exam, sample persons aged 15 years and older will be administered the oral health-related quality of life questionnaire. Response options for the seven questions include yes (code = 1), no (code = 2), and can't respond (code = 9).

Oral Health-Related Quality of Life Questionnaire - NHANES IV

1. During the past month, have you had painful aching anywhere in your mouth?
2. During the past month, have you had trouble pronouncing any words because of problems with your teeth,
   mouth, or dentures?
3. During the past month, have you had difficulty doing your usual jobs or attending school because of problems

with your teeth, mouth, or dentures?
4. During the past month has your sense of taste been affected by problems with your teeth, mouth, or dentures?
5. During the past month, have you avoided particular foods because of problems with your teeth, mouth, or
dentures?
6. During the past month, have you found it uncomfortable to eat any foods because of problems with your teeth,
mouth, or dentures?
7. During the past month, have you been self-conscious or embarrassed because of your teeth, mouth, or dentures?

Source: National Institute of Dental and Craniofacial Research. Proposal for the Oral Health Examination in the National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC, 2001.

Established Modifications N/A

Federal Survey Modifications N/A

References

References Textbooks, Manuals, and the Internet:

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Validaty

Reliability

Listing of Publications with Surveys &

Surveys & Studies United States Surveys & Studies:

National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.

Oral Hygiene Index

Procedure & Method Information

Name of Procedure/Method Oral Hygiene Index

Abbreviation OHI

Purpose To assess oral hygiene or cleanliness.

Year of Establishment 1960

Type of Procedure/Method

Developer(s) J.C. Greene and J.R. Vermillion

Oral Condition Category

Background Information

Background Information

The Oral Hygiene Index (OHI) was developed in 1960 by John C. Greene and Jack R. Vermillion to classify and assess oral hygiene status. The OHI is based on the combination of two indices, the Debris Index (DI) and the Calculus Index (CI). It has had wide acceptance and usage in surveys for assessing tooth brushing efficiency and frequency and evaluating community dental health practices. The OHI is considered a simple, rapid, and sensitive measure (Greene and Vermillion, 1960).

Changes Over Time

In 1964, John C. Greene and Jack R. Vermillion simplified the Oral Hygiene Index. The modified version is called the Simplified Oral Hygiene Index (OHI-S). For more information, please see Simplified Oral Hygiene Index.

Procedure Method

Procedure Method

As stated previously, the OHI is the combination of two indices, the Debris Index (DI) and the Calculus Index (CI).

To obtain the DI and the CI, the buccal/labial and lingual surfaces of three segments, (1) the right posterior region, the segment distal to the right cuspid, (2) the left posterior region, the segment distal to the left cuspid, and (3) the anterior region, the segment mesial to the right and left first bicuspids, are examined in both the upper and lower arch for debris and calculus, respectively.

For the DI, the surface area covered by debris, defined as soft foreign matter consisting of mucin, bacteria, and food and varying in color from grayish white to green or orange, is estimated by running the side of a No. 5 explorer (i.e., Shepard's hook) along the buccal/labial and lingual surfaces and noting the occlusal or incisal extent of the debris as it is removed from the tooth surface (Greene and Vermillion, 1960). This same procedure is utilized for estimating the amount of supragingival and subgingival calculus for the CI, where calculus is defined as deposits of inorganic salts composed primarily of calcium carbonate and phosphate mixed with food debris, bacteria, and desquamated epithelium cells (Greene and Vermillion, 1960). The oral hygiene examination and scoring for the DI always should precede the oral exam and scoring for the CI.

The scoring for the buccal/labial and lingual surfaces is based on the tooth in the designated segment that has the greatest surface area of debris for the DI or supragingival and subgingival calculus for the CI. Therefore, the buccal/labial score and the lingual score for a segment need not be taken from the same tooth. In all, there are a total of 12 scores and a maximum number of 6 segments examined. According to the developers, less than four minutes per person were required to record scoring for oral hygiene (Greene and Vermillion, 1960). The criteria and scoring for the DI and CI are as follows:

Debris Index - Scoring and Criteria (Greene and Vermillion, 1960)

0 = No debris or stain present.
1 = Soft debris covering not more than one-third of the tooth surface being examined or the presence of extrinsic stains without debris regardless of surface area covered.
2 = Soft debris covering more than one-third, but not more than two-thirds, of the exposed tooth surface.
3 = Soft debris covering more than two-thirds of the exposed tooth surface.

Calculus Index - Scoring and Criteria (Greene and Vermillion, 1960)

0 = No calculus present.
1 = Supragingival calculus covering not more than one-third of the exposed tooth surface being examined.
2 = Supragingival calculus covering more than one-third but not more than two-thirds of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.
3 = Supragingival calculus covering more than two-thirds of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth or both.

Source: Greene JC, Vermillion JR. Oral hygiene index: a method for classifying oral hygiene status. J Am Dent Assoc. 1960;61:172-179.

For the OHI, only fully erupted permanent teeth, defined as teeth whose occlusal or incisal surface has reached the occlusal plane, are examined and scored. In addition, third molars are not examined or scored due to the wide variations of clinical crown height.

For the DI and CI, the sequence of the oral hygiene exam should proceed in the following manner: First, the buccal, then the lingual surfaces of the teeth in the upper right posterior segment. Next, the labial and lingual surfaces of the teeth in the upper anterior segment. And finally, the buccal and lingual surfaces of the upper left posterior. This same procedure continues in the lower arch, except from left to right, the lower left posterior segment, lower anterior segment, and the lower right posterior segment.

Afterwards, the buccal/labial and lingual scores are tabulated and totaled for each segment and arch. Again, the debris and calculus scores should be tabulated separately and the indices for each calculated independently. For an individual, the formulas for the DI and CI are:

DI = Buccal total score + Lingual total score/Number of segments scored

CI = Buccal total score + Lingual total score/Number of segments scored

To calculate the OHI, as illustrated, the DI and CI are summed: OHI = DI + CI

The DI and CI values range from 0 to 6, and OHI value ranges from 0 to 12. The OHI can also be calculated for groups by dividing the sum of the indices determined for individuals by the total number of persons.

Established Modifications

For more information, see the Simplified Oral Hygiene Index.

Federal Survey Modifications

None

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Orofacial Pain Procedures in the National Health and Nutrition Examination Survey (NHANES) IV

Procedure & Method Information

Name of Procedure/Method Orofacial Pain Procedures in the National Health and Nutrition Examination Survey (NHANES) IV

Abbreviation N/A

Purpose To assess the prevalence of orofacial pain.

Year of Establishment N/A

Type of Procedure/Method

Developer(s) National Center for Health Statistics (NCHS), United States

Oral Condition Category

Background Information

Background Information

In National Health and Nutrition Examination Survey (NHANES) IV, 1998-2004, sample persons (SPs) from the age of 10 to 69 years received the orofacial pain assessment. This assessment consisted of two parts, a questionnaire and a physical examination. SPs aged 10 to 12 years received only the questionnaire portion, while SPs aged 13 to 69 years received both the questionnaire and the physical examination.

The Orofacial Pain Questionnaire assesses the frequency of five different types of orofacial pain, toothache pain or painful tooth for ages 10-69 years, sores or irritations for ages 10-69 years, jaw joint pain among ages 13-69 years, dull and aching facial pain among ages 13-69 years, and burning sensations in the mouth for ages 18-69 years. A positive response to any of the above five orofacial pain categories leads to further questions regarding the frequency of that specific type of pain in the last 30 days, and two quality of life questions. For the physical exam, the prevalence of pain is evaluated by the palpation of the masseter muscle and temporomandibular joint (TMJ).

Changes Over Time N/A

Procedure Method

Procedure Method

For the orofacial pain questionnaire session, SPs are simply interviewed by the dental recorder, and the SPs' responses are recorded as noted.

The physical exam has three assessments, the maximal incisal opening, palpation of the masseter muscle, and palpation of the TMJ. The following general guidelines are adhered to for all three. They are:

- All of the orofacial pain assessments are conducted with the jaw muscles in the passive state. The joints and muscles should not receive additional weight or pressure other than that of joint and muscle palpation at any time.

- SPs should be positioned at a 90-degree angle to the examiner.

- SPs with replacement prostheses are examined with the prostheses in place. Bite plates and other appliances that do not replace teeth are to be removed.

- The examiner must keep nails short in order to safely use fingertips for palpation.

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.

The first assessment is the determination of the maximal incisal opening. First, the SP is asked to position his/her mandible or jaw in a comfortable position and to open his/her mouth as wide as possible, even if pain occurs. Then, using a endodontic ruler, measure from the incisal edge of the most vertically oriented upper or maxillary central incisor to the labio-incisal edge of the opposing lower or mandibular incisor. If a prosthesis has replaced the central incisors, examine from the incisal edge of the prosthetic or replacement tooth. If the SP is edentulous and does not have a prosthetic device, then the maximal incisal opening cannot be assessed (i.e., code "99"). The measurement is dictated in whole millimeters (mm) to the recorder, and fractional measurements are rounded down to the nearest whole number. The calls for maximal incisal opening are as follows:

0 - 65 = Measurement in mm (where 65 = 65 mm or greater)
99 = Cannot be assessed.

The next two assessments are the palpations of the masseter muscle and the TMJ. These two assessments also have specific general guidelines that are followed, in addition to the general guidelines for the entire physical exam. They are:

- Examination of muscles and joint capsules for tenderness requires pressing on a specific site with standardized pressure. Use the fingertips of the index and third fingers or the spade-like pad of the distal phalanx of the index finger only. The standardized pressure is as follows: masseter muscle with 2 pounds (lbs.) of pressure and joints with 1 lb. of pressure.

- Each palpation is done on the SP's right side first, then the left side.

- Palpate while using the opposite hand to brace the head to provide stability. Do not press down on the SP's head with pressure. The SP's mandible should be in a resting position, without teeth touching. Palpate while muscles are in a passive state.

- First locate the site of palpation using the landmarks described and then press/palpate.

- Ask the SP if the palpation hurts (i.e., "Is that painful?").

- Equivocal responses and responses of "pressure only" are to be reported as "no pain upon palpation" (i.e., code "2").

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.

For the masseter muscle assessment, 2 lbs. of finger pressure are applied during the entire palpation and the muscle is palpated in a Z-shaped fashion starting from the origin (i.e., the superior border) to the body of masseter muscle followed by the insertion (i.e., the inferior border). From the origin, begin 1 centimeter (cm) directly in front of the TMJ and below the zygomatic arch and palpate anteriorly towards the border. At the body of the masseter muscle, continue just below the zygomatic process and palpate diagonally down and back to the angle of the mandible across a surface area of approximately two fingers wide. Then, at the insertion of the masseter muscle, begin 1 cm superiorly and anteriorly to the angle of the mandible and palpate to the anterior border. As stated above, the palpation is conducted first on the right side of the face and then on the left.

Afterwards, the palpation of the TMJ is done. Again, apply 1 lb. of digital pressure. The palpation of the TMJ can be conducted in one of two ways, the open-mouth position (i.e., lateral pole) or closed-mouth position (i.e., posterior attachment).

In the open-mouth position or lateral pole, ask the SP to relax and double check that the SP is not clenching his/her teeth. After, place index finger just anterior to the tragus of the ear and over the SP's TMJ, and then ask the SP to open slightly until the lateral pole of the condyle is translated forward. While supporting the SP's head with the opposite hand, palpate applying 1 lb. of pressure and asking the SP if he/she feels pain after each palpation.

For the closed-mouth position or posterior attachment, first explain the procedure to the SP before proceeding. Then, place the tip of the left little finger into the SP's right external meatus. Next, point fingertip towards oneself and ask the SP to open his/her mouth slightly or wide, if necessary, to make sure the fingertip can feel the the joint movement. While maintaining firm fingertip pressure, ask the SP to close his/her mouth and whether pain is apparent. The exam is repeated on the left side by inserting the right little finger into the left external meatus and proceeding as indicated above.

For each orofacial palpation assessment, the masseter muscle and TMJ, the occurrence of pain is determined and coded as follows:

1 = Pain upon palpation
2 = No pain upon palpation
9 = Cannot be assessed

Established Modifications N/A

Federal Survey Modifications N/A

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Textbooks, Manuals, and the Internet:

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Validaty

Reliability

Listing of Publications with Surveys &

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United States Surveys & Studies:

National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.

Peer Assessment Rating Index

Procedure & Method Information

Name of Procedure/Method Peer Assessment Rating Index

Abbreviation PAR

Purpose To assess the outcome of orthodontic treatment at any stage.

Year of Establishment 1992

Type of Procedure/Method

Developer(s) S. Richmond, W.C. Shaw, K.D. O'Brien, I.B. Buchanan, R. Jones, C.D. Stephens, C.T. Roberts, and M. Andrews

Oral Condition Category

Background Information

Background Information

The Peer Assessment Rating (PAR) Index, previously referred to as the Index of Treatment Standards, was described by S. Richmond, W.C. Shaw, K.D. O'Brien, I.B. Buchanan, R. Jones, C.D. Stephens, C.T. Roberts, and M. Andrews in 1992 to measure malocclusion and assess the outcome of orthodontic treatment at any stage (e.g., pre- and post-treatment).

The PAR Index provides a single summary score for alignment and occlusion and consists of 11 components. They are (1) upper right segment, (2) upper anterior segment, (3) upper left segment, (4) lower right segment, (5) lower anterior segment, (6) lower left segment, (7) right buccal occlusion, (8) overjet, (9) overbite, (10) centerline, and (11) left buccal occlusion. Its score is an estimate of how far one's alignment and occlusion deviate from "normal" and the difference between the PAR scores for pre- and post-treatment reflects the degree of improvement and success of treatment.

The PAR Index is considered a quick, valid, and highly reliable index that has gained widespread usage and acceptance in the United Kingdom and Europe (Shaw, Richmond, O'Brien, Brook, and Stephens, 1991; Richmond, Shaw, O'Brien, Buchanan, Jones, Stephens, Roberts, and Andrews, 1992; McGuinness and Stephens, 1994).

Changes Over Time None

Procedure Method

Procedure Method

The PAR Index is applied to dental casts pre- and post-treatment using a specially designed ruler to facilitate the scoring components outlined below. The PAR ruler is translucent and has the PAR components (i.e., displacements; antero-posterior, vertical, and transverse buccal occlusion; overjet; overbite; and centreline) listed along with their scoring codes and criteria to assist with measurement and scoring.

Anterior and Buccal Segments

The dental arches (i.e., the upper and lower arches) of the mouth are divided into three recording segments: the left buccal segment, the right buccal segment, and the anterior segment. Scores are recorded for both the upper and lower arches. The buccal segment recording zone is from the mesial anatomical contact point of the first permanent molar to the distal anatomical contact point of the canine (cuspid), and the anterior recording zone is from the mesial anatomical contact point of the canine (cuspid) on one side to the mesial anatomical contact point of the canine on the other side.

For each segment, the occlusal traits that are recorded are crowding, spacing, and impacted teeth. The displacements are the shortest distance between contact points of adjacent teeth parallel to the occlusal plane, and they are not scored between the first, second, and third molars since the contacts are so broad and extremely variable within the normal range (Richmond, Shaw, O'Brien, Buchanan, Jones, Stephens, Roberts, and Andrews, 1992). A tooth is considered and scored as "impacted" when the space is less than or equal to 4 millimeters (mm). Impacted canines are recorded in the anterior segment. Afterward, the scores for the displacements and impactions are added together to obtain an overall score for each recording zone or segment.

In instances of mixed dentition, if there is potential crowding, the average mesio-distal widths are used to calculate space deficiency.

Anterior and Buccal Segments Displacement Scores

Score	Discrepancy
0	0 mm to 1 mm
1	1.1 mm to 2 mm
2	2.1 mm to 4 mm
3	4.1 mm to 8 mm
4	Greater than 8 mm
5	Impacted teeth

Source: Richmond S, Shaw WC, O'Brien KD, Buchanan IB, Jones R, Stephens CD, Roberts CT, Andrews M. The development of the PAR Index (Peer Assessment Rating): reliability and validity. Eur J Orthod. 1992 Apr;14(2):125-39.

Mixed Dentition Crowding Assessment Using Average Mesio-Distal Widths

Upper
  canine - 8 mm
  1st molar - 7 mm
  2nd molar - 7 mm
Total = 22 mm (impaction <= 18 mm)

Lower
canine - 7 mm
1st molar - 7 mm
2nd molar - 7 mm
Total = 21 mm (impaction <= 17 mm)

Source: Richmond S, Shaw WC, O'Brien KD, Buchanan IB, Jones R, Stephens CD, Roberts CT, Andrews M. The development of the PAR Index (Peer Assessment Rating): reliability and validity. Eur J Orthod. 1992 Apr;14(2):125-39.

Buccal Occlusion

While in occlusion, the buccal occlusion is scored for both the right and left sides with respect to three planes of space, the antero-posterior, vertical, and transverse. The recording zone is from the canine to the last molar present (i.e., either the first, second, or third molar). Temporary developmental stages and submerging deciduous teeth are excluded (Richmond, Shaw, O'Brien, Buchanan, Jones, Stephens, Roberts, and Andrews, 1992). For each buccal occlusion, the scores for the three planes of space are summed.

Buccal Occlusion Assessments

Score	Discrepancy

Antero-posterior

0 - Good interdigitation Class I, II, and III
1 - Less than half unit discrepancy
2 - Half a unit discrepancy (cusp to cusp)

Vertical

0 - No discrepancy in intercuspation
1 - Lateral open bite on at least two teeth greater than 2 mm

Transverse

0 - No cross-bite
1 - Cross-bite tendency
2 - Single tooth in cross-bite
3 - More than one tooth in cross-bite
4 - More than one tooth in scissor bite

Source: Richmond S, Shaw WC, O'Brien KD, Buchanan IB, Jones R, Stephens CD, Roberts CT, Andrews M. The development of the PAR Index (Peer Assessment Rating): reliability and validity. Eur J Orthod. 1992 Apr;14(2):125-39.

Overjet

The overjet assessment includes positive overjet as well as teeth in cross-bite. The recording zone is from the left lateral incisor to the right lateral incisor and is scored from the most prominent feature of any one incisor. When assessing overjet, the PAR ruler is held parallel to the occlusal plane and radial to the line of arch. The scores for the overjet plus the cross-bite are totaled for the overall overjet score.

Overjet Measurements

Score	Discrepancy

Overjet
0 - 0 to 3 mm
1 - 3.1 to 5 mm
2 - 5.1 to 7 mm
3 - 7.1 to 9 mm
4 - Greater than 9 mm

Anterior Cross-Bites
0 - No discrepancy
1 - One or more teeth edge to edge
2 - One single tooth in cross-bite
3 - Two teeth in cross-bite
4 - More than two teeth in cross-bite

Source: Richmond S, Shaw WC, O'Brien KD, Buchanan IB, Jones R, Stephens CD, Roberts CT, Andrews M. The development of the PAR Index (Peer Assessment Rating): reliability and validity. Eur J Orthod. 1992 Apr;14(2):125-39.

Overbite

Overbite is the vertical overlap or open bite of the anterior teeth in relation to the coverage of the lower incisors or the degree of open bite. The recording zone includes the lateral incisors, and the tooth with the greatest overlap is recorded. Cross-bites including the canines are recorded in the anterior segment.

Overbite Measurements

Score	Discrepancy

Open bite
0 - No open bite
1 - Open bite less than and equal to 1 mm
2 - Open bite 1.1 to 2 mm

3 - Open bite 2.1 to 3 mm
4 - Open bite greater than or equal to 4 mm

Overbite
0 - No discrepancy
1 - One or more teeth edge to edge
2 - One single tooth in cross-bite
3 - Two teeth in cross-bite
4 - More than two teeth in cross-bite

Source: Richmond S, Shaw WC, O'Brien KD, Buchanan IB, Jones R, Stephens CD, Roberts CT, Andrews M. The development of the PAR Index (Peer Assessment Rating): reliability and validity. Eur J Orthod. 1992 Apr;14(2):125-39.

Centreline

The centreline assessment is the centreline discrepancy in relation to the lower central incisors. If a lower central incisor has been extracted, the measurement is not recorded.

Centreline Assessments

Score	Discrepancy
0 - Coincident and up to one-quarter lower incisor width	
1 - One quarter to one-half lower incisor width	
2 - Greater than one-half lower incisor width	

Source: Richmond S, Shaw WC, O'Brien KD, Buchanan IB, Jones R, Stephens CD, Roberts CT, Andrews M. The development of the PAR Index (Peer Assessment Rating): reliability and validity. Eur J Orthod. 1992 Apr;14(2):125-39.

Once the total scores for each of the 11 components are obtained, the scores are summed to calculate the overall PAR score. A score of zero would indicate excellent alignment and occlusion, and higher scores, rarely beyond 50, would indicate increasing levels of alignment and malocclusion.

For determining outcome of treatment, the change in the pre- and post-treatment PAR scores indicates the degree of improvement and success of treatment. The degree of improvement may also be determined objectively using a nomogram. A nomogram is divided into three sections, an upper (i.e., worse, no difference), a middle (i.e., improved), and a lower (i.e., greatly improved). The PAR scores for pre- and post-treatment are read from the respective axes and where the intercept falls reflects the degree of individual improvement (McGuinness and Stephens, 1994).

PAR Index Guidelines

General

1. All scoring is accumulative.
2. There is no maximal cut-off level.
3. The occlusion should be scored disregarding functional displacement (this cannot be determined from dental casts alone).
4. The contact points between the first, second, and third molars are not recorded. The contact points between molars are so variable, however, severe deviations will produce a cross-bite, and will be noted in the buccal occlusions.
5. If the contact point displacement is as a result of poor restorative work (restorations or crowns), the displacement is not recorded.
6. Contact points between deciduous teeth are not recorded.
7. Extraction spaces are not recorded if the patient is to receive a prosthetic replacement. However, if space closure is intended, the distance between adjacent teeth should be noted.

Canines

1. Where there are missing canines, displacements resulting from discrepancies between the mesial contact point to the first premolar and the distal of the lateral incisor should be recorded in the anterior segment.
2. Canine cross-bites should be recorded in the overjet section.
3. Contact points between the canines and premolars are scored as follows: the distal contact point of the canine to the midpoint on the mesial surface of the adjacent premolar. (These contact points are so variable. When untreated normal occlusions were assessed, this relationship seemed to be the most acceptable.)

Impactions

If a tooth is unerupted and displaced from the line of the arch either buccally or palatally due to insufficient space, this is regarded as an impaction. However, if the tooth is erupted and displaced, the displacement score is recorded.

Incisors

1. If there is agenesis of the upper incisor or the tooth has been lost due to trauma or caries, the procedure is as follows: (a) if the space is maintained (for a prosthesis), the distance between adjacent teeth is not recorded; (b) if the space is to be closed, the distance between adjacent teeth is recorded.
2. When recording an overjet, if the tooth falls on the line, the lower grade is recorded.
3. If a lower incisor has been extracted or is missing, the centreline is not recorded.

Molars

1. Contact points between first and second molars are not recorded.
2. If the first molars have been extracted, the contact point of the second molar is recorded.

Source: Richmond S, Shaw WC, O'Brien KD, Buchanan IB, Jones R, Stephens CD, Roberts CT, Andrews M. The development of the PAR Index (Peer Assessment Rating): reliability and validity. Eur J Orthod. 1992 Apr;14(2):125-39.

Established Modifications

None

Federal Survey Modifications

None

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Periodontal Disease Index

Procedure & Method Information

Name of Procedure/Method Periodontal Disease Index

Abbreviation PDI

Purpose To assess the prevalence and severity of gingivitis and periodontitis.

Year of Establishment 1959

Type of Procedure/Method

Developer(s) S.P. Ramfjord

Oral Condition Category

Background Information

Background Information

In 1959, the Periodontal Disease Index (PDI) was developed by S.P. Ramfjord to assess the prevalence and severity of gingivitis and periodontitis. As in the case of the Periodontal Index (PI), the PDI was developed due to a lack of methodologies to determine prevalence and severity and with the intent to be a more sensitive version of the PI for use in clinical trials (Burt and Eklund, 1999). The PDI was devised for use among large populations, as well as individuals and small groups, unlike the Periodontal Index (PI). The PDI has been purported to be sufficiently accurate for use in longitudinal studies (Schluger, Yuodelis, Page, and Johnson, 1990).

The pathological manifestations for the PDI include the presence and extent of gingival inflammation and pocket formation. The PDI scale ranges from 0 to 6 with increasing prevalence and severity of disease.

Today, the PDI is not utilized as much as before; however, its indirect method of measuring loss of periodontal attachment is still in use.

Changes Over Time None

Procedure Method

Procedure Method

To assess the Periodontal Disease Index (PDI), the teeth should first be dried with cotton, then the mesial, buccal, distal, and lingual aspects of only six teeth, known as the "Ramfjord teeth," are examined. Palpation, probing, and observation should be combined to evaluate form, density, and tendency of the gingival tissues to bleed (Ramfjord, 1959). Each tooth is assigned a numeric value that characterizes the status of tissue inflammation and attachment as defined in the criteria below. For more information on the procedure to assess attachment, please see method, Loss of Periodontal Attachment (LPA).

The six teeth that are evaluated for the PDI include the right first molar (#3), the left central incisor (#9), and the left first premolar (#12) in the maxillary arch. In the mandibular or lower arch, the left first molar (#19), the right central incisor (#25), and the right first premolar or bicuspid (#28) are examined. The examination is estimated to take less than five minutes per person.

The scale values for the PDI range from 0 to 6. The gingivitis score ranges from 0 to 3 based on the severity of inflammation, and the attachment loss score is from 4 to 6 on the basis of the gingival pocket apical distance from the cementoenamel junction (CEJ). As a consequence, gingivitis and pocket depth (i.e., loss of attachment) from the CEJ are scored separately. Therefore, if loss of attachment is present, the score range for gingivitis is ignored. For example, if the gingival pocket in any of the four measured areas (i.e., mesial, distal, buccal, and lingual) extends apically to the CEJ, but no more than a distance of 3 millimeters (mm), the tooth is assigned a score of 4. If the gingival pocket extends apically from 3 to 6 mm in relation to the CEJ, the tooth is assigned a score of 5, and 6 if the loss of attachment is greater than 6 mm.

Periodontal Disease Index (PDI) Scoring and Criteria

0 = No inflammation
1 = Mild to moderate gingivitis localized
2 = Mild to moderate gingivitis generalized
3 = Advanced gingivitis
4 = Up to 3 mm attachment loss
5 = 3 - 6 mm attachment loss
6 = > 6 mm attachment loss

Source: Northern Arizona University (1998). The Epidemiology of Periodontal Diseases. Retreived September 13, 1999, from the World Wide Web: http://www.nauonline.nau.edu/welcome/tdrive/dh418/lesson.

To calculate the PDI, the individual scores for each of the six examined teeth are summed and divided by 6, the number of teeth examined. For the PDI, only fully erupted teeth are scored and missing teeth should not be substituted. So, if only four teeth were examined, the individual scores for these four teeth should be totaled and divided by 4 to calculate the PDI. For individuals, the PDI can be rounded off to one decimal point; however, for population groups, two decimal places should be used for the computation of scores (Ramfjord, 1959).

PDI = Total of individual tooth scores/No. of teeth examined

Established Modifications None

Federal Survey Modifications None

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Periodontal Index (also termed Russell's Index)

Procedure & Method Information

Name of Procedure/Method Periodontal Index (also termed Russell's Index) *Abbreviation* PI

Purpose To assess the prevalence and severity of gingivitis and destructive periodontal disease.

Year of Establishment 1967 *Type of Procedure/Method*

Developer(s) A.L. Russell *Oral Condition Category*

Background Information

Background Information

After 10 years of development, the Periodontal Index (PI) was introduced by its developer, A.L. Russell, in 1967 to measure the status of periodontal disease. The index was developed because of a lack of sophisticated methodologies to assess the prevalence and severity of gingivitis and destructive periodontal disease.

Initially, epidemiologic studies of gingival and periodontal disease in large populations were directed simply toward segregating individuals into subgroups on the basis of clinical appearance of the tissues of the anterior teeth. These observations only permitted evaluation of the relative proportions of affected and unaffected individuals in the populations under consideration (Schluger, Yuodelis, Page, and Johnson, 1990). So, according to the World Health Organization, the PI has made great strides to the epidemiology of periodontal disease due to its definition that very quickly achieved wide international acceptance (World Health Organization, 1999). However, today, this index is not used much in epidemiologic surveys because of the introduction of new periodontal indices and refinement of criteria amid increasing periodontal research.

The pathological manifestations for the PI include the presence and extent of inflammation, pocket formation, mobility, and loss of function. The scale of values for the PI ranges from 0 to 8 with increasing prevalence and severity of disease. The PI is reported to be useful among large populations, but it is only of limited use for individuals or small groups.

Changes Over Time None

Procedure Method

Procedure Method

The PI is assessed by examining the surrounding tissue of each tooth and assigning a numeric value, ranging from 0 to 8, that represents the state of tissue attachment based on a set of rigid criteria as outlined under the heading, Periodontal Index (PI) Scoring and Criteria.

The values for the individual teeth are summed and divided by the number of teeth examined to determine the overall score. Clinical conditions pertaining to the overall PI score have also been observed and are defined in the section labeled Periodontal Index (PI) Score and Gum Clinical Manifestations. If there is doubt about the correct value, the lower or more conservative PI value should be used.

Periodontal Index (PI) Scoring and Criteria

0 = Negative. There is neither overt inflammation in the investing tissues nor loss of function due to destruction of supporting tissue.

1 = Mild Gingivitis. An overt area of inflammation in the free gingiva does not circumscribe the tooth.

2 = Gingivitis. Inflammation completely circumscribes the tooth, but there is no apparent break in the epithelial attachment.

6 = Gingivitis with Pocket Formation. The epithelial attachment has been broken and there is a pocket (not merely a deepened gingival crevice due to swelling in the free gingivae). There is no interference with normal masticatory function; the tooth is firm in its socket and has not drifted.

8 = Advanced Destruction with Loss of Masticatory Function. The tooth may be loose, may have drifted, may sound dull on percussion with metallic instrument, or may be depressible in its socket.

Source: Russell AL. The Periodontal Index. J Periodontol 1967;38(Part II):585-91.

Periodontal Index (PI) Score and Gum Clinical Manifestations

0.0 - 0.2 = Clinically normal supportive tissues
0.3 - 0.9 = Simple gingivitis
0.7 - 1.9 = Beginning destructive periodontal disease
1.6 - 5.0 = Established destructive periodontal disease
3.8 - 8.0 = Terminal disease

Source: Russell AL. The Periodontal Index. J Periodontol 1967;38(Part II):585-91.

Established Modifications None

Federal Survey Modifications See Procedure Method above.

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Philip C. Fox's Four Question Dry Mouth Protocol

Procedure & Method Information

Name of Procedure/Method Philip C. Fox's Four Question Dry Mouth Protocol

Abbreviation None

Purpose To identify signs of dry mouth (i.e., xerostomia).

Year of Establishment 1987

Type of Procedure/Method

Developer(s) P.C. Fox

Oral Condition Category

Background Information

Background Information

On the basis of findings from a study conducted in 1987 with 100 patients complaining of dry mouth, P.C. Fox observed that the positive responses to four questions were associated with measurable salivary gland hypofunction (Fox, 1997). Xerostomia, or dry mouth, in most cases, but not all, is related to reductions in salivary output (i.e., salivary hypofunction) most commonly caused by medications, radiation, and systemic diseases such as Sjogren's syndrome.

In Fox's Four Question Dry Mouth Protocol, the four questions refer to the oral functions during meals in which salivary flow is expected to be maximally stimulated; therefore, it is probable that continuing complaints of dryness in these circumstances will identify cases of significant dysfunction (Fox, 1997).

Changes Over Time None

Procedure Method

Procedure Method

In the P.C. Fox Dry Mouth Protocol, subjects are asked the four questions listed below. In addition, subjects should also be questioned in detail about their dry mouth complaints, with special attention to when and during what activities the symptom of dry mouth is present.

Xerostomia, or dry mouth, alone is not considered a reliable indicator of salivary hypofunction and should not be used as a diagnosis (Fox, 1997; Wu and Fox, 1994). Therefore, the exam should also entail a full and systematic evaluation (e.g., a complete medical history, physical exam, saliva collection, and serologic evaluation).

Philip C. Fox's Four Question Dry Mouth Protocol

1. Does your mouth feel dry when eating a meal?
2. Do you have difficulties swallowing any foods?
3. Do you sip liquids to aid in swallowing dry foods?
4. Does the amount of saliva in your mouth seem to be too little, too much, or you don't notice it?

Note: Positive responses to questions 1 through 3 or the impression of too little saliva (question 4) were predictive of significantly diminished salivary output measured by objective means.

Source: Fox PC. Management of dry mouth. Dent Clin North Am. 1997 Oct;41(4):863-75.

Established Modifications None

Federal Survey Modifications None

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Validaty

Reliability

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Plaque Index

Procedure & Method Information

Name of Procedure/Method Plaque Index

Abbreviation PlI

Purpose To assess the prevalence and severity of plaque build-up.

Year of Establishment 1964

Type of Procedure/Method

Developer(s) J. Silness and H. Loe

Oral Condition Category

Background Information

Background Information

In 1964, the Plaque Index (PlI) was developed by J. Silness and H. Loe to be used along with their Gingival Index (GI), even though it can be used alone. The PlI assesses the prevalence and severity of plaque build-up according to its thickness at the gingival margin rather than at the coronal extension. The assessment of plaque is made on top of calculus deposits, fillings, and crowns (Loe, 1967; Fischman, 1986).

This index is one of the most widely used and recognized among the plaque indices that has demonstrated good validity and reliability (Mander and Mainwaring, 1980; Gobbels, Schneider, Apel, and Draht, 1990). It can be used on all surfaces of all or selected teeth or for selected surfaces of all or selected teeth. However, one criticism is the subjectivity in estimating plaque. Therefore, it is recommended that a single examiner be trained and used with each group of patients throughout a clinical trial (Fischman, 1986).

The PlI may be used in large-scale epidemiological studies as well as for smaller groups or within the dentition of an individual. It has been applied to studies involving children and adults and is considered a reliable technique for evaluating both mechanical anti-plaque procedures and chemical agents (Fischman, 1986).

Changes Over Time None

Procedure Method

Procedure Method

To obtain the PlI, the examiner first will need sufficient lighting, a mouth mirror, and probe. The teeth and gingiva (gums) should also be dried lightly with a blast of air. No cotton rolls should be used to avoid interference with soft deposits.

Then, the four surfaces (i.e., buccal, lingual, mesial, and distal) of six teeth are examined by running the probe (i.e., explorer) supragingivally and subgingivally along the surfaces and scoring the findings according to the criteria below (Silness and Loe, 1964). The six teeth that are evaluated are the maxillary right first molar, the maxillary right lateral incisor, the maxillary left first bicuspid, the mandibular left first molar, the mandibular left lateral incisor, and the mandibular right first bicuspid. Missing teeth are not substituted. The examination and scoring of the six teeth for the PlI take approximately two minutes per person according to the developers.

To calculate the PlI for an individual, each of the four gingival areas of the tooth is given a score from 0 to 3 as described below. Then, the four scores from the gingival area are added and divided by 4 to give the PlI for the tooth. Afterwards, the PlI for the teeth are added and divided by the number of teeth examined (i.e., 6). In addition, the scores for individual teeth (i.e., incisors, premolars, and molars) may be grouped to determine the PlI for groups of teeth.

Criteria for the Plaque Index (PlI) (Silness and Loe, 1964)

0 = No plaque.

1 = A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be seen in situ only after application of disclosing solution or by using the probe on the tooth surface.

2 = Moderate accumulation of soft deposits within the gingival pocket, or on the tooth and gingival margin which can be seen with the naked eye.

3 = Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.

Source: Silness J, Loe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. Acta Odont Scand. 1964; 22:121-35.

Established Modifications

In 1967, Loe detailed the sequence of the examination procedure and slightly modified the criteria and the exam procedure to include the entire dentition instead of six teeth. The detailed exam is as follows:

The typical exam of all the surfaces of all teeth usually starts with the upper right second molar and continues over the midline to the upper left second molar. For teeth on the right side of the midline, the exam sequence is distal, buccal (labial), and mesial. On the left side, the exam sequence is mesial, buccal (labial), and distal. When the three surfaces of all teeth have been scored, the lingual surfaces of all the upper or maxillary teeth are assessed beginning with the upper left second molar.

For the lower or mandibular arch, the exam begins with the lower left second molar through to the right second molar. On the left side of the midline, the exam sequence is distal, buccal (labial), and mesial, and on the right side it is mesial, buccal (labial), and distal. Afterwards, all lingual surfaces are scored beginning with the left second molar. Third molars or wisdom teeth are not examined or scored in the upper or lower arch. In addition, when both the GI and PlI are to be assessed, the examination for the PlI should always precede the examination for the GI. Under optimal conditions and chair-side assistance, the scoring of all teeth for the PlI takes approximately five minutes per person according to research.

Criteria for the Plaque Index (PlI)   (Loe, 1967)

0 = No plaque in the gingival area.

1 = A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be recognized only by running a probe across the tooth surface.

2 = Moderate accumulation of soft deposits within the gingival pocket, on the gingival margin and/or adjacent tooth surface, which can be seen by the naked eye.

3 = Abundance of soft matter within the gingival pocket and/or on the gingival margin and adjacent tooth surfaces.

Source: Loe H. The Gingival Index, the Plaque Index, and the Retention Index Systems. J Periodontol, part II, 1967; 38(Suppl):610-6.

Federal Survey Modifications

None

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Research Diagnostic Criteria for Temporomandibular Disorders

Procedure & Method Information

Name of Procedure/Method Research Diagnostic Criteria for Temporomandibular Disorders

Abbreviation RDC/TMD

Purpose To diagnose temporomandibular disorders in a standardized manner.

Year of Establishment 1992

Type of Procedure/Method

Developer(s) S.F. Dworkin et al.

Oral Condition Category

Background Information

Background Information

In the early 1990s, the Research Diagnostic Criteria for Temporomandibular Disorders, also known as RDC/TMD, were established by S.F. Dworkin et al. to create valid and reliable standardized diagnostic criteria for defining and/or classifying the different types of TMD. The RDC/TMD was developed for the purpose of collecting relevant data and comparing survey/study research findings (Dworkin and LeResche, 1992).

The RDC/TMD is used only for clinical and epidemiologic research purposes. It provides information for the most common forms (i.e., muscle-related and temporomandibular junction [TMJ]-related) of TMD. Some of the less common conditions not included in the RDC/TMD are ankylosis, aplasia or hyperplasia, contracture or hypertrophy, and neoplasms.

TMD is viewed as a multidimensional chronic pain condition. The RDC/TMD thus uses a comprehensive diagnostic approach. It combines the psychological and behavioral/social aspects with the pathophysiology of pain (Dworkin and LeResche, 1992).

The RDC/TMD is divided into two sections, Axis I and Axis II. Axis I is called the Clinical TMD Conditions and measures physical findings (i.e., structural and functional abnormalities of masticatory muscles and/or the TMJ). It is nonhierarchical and allows for possible multiple diagnoses per subject (Dworkin and LeResche, 1992). The diagnoses are categorized into three Groups: muscle disorders (Group I); disc displacements (Group II); and arthralgia, arthritis, and arthrosis (Group III). Axis II, the Pain-Related Disability and Psychological Status, evaluates the psychosocial status of TMD, in terms of chronic pain dysfunction (i.e., pain intensity and pain-related disability), depression, and nonspecific physical symptoms. Axis II also assesses limitations in the ability to the use the jaw.

The RDC/TMD may be used by themselves (i.e., Axes I and II) or incorporated into broader research or clinical protocols. When using the RDC/TMD, it is strongly recommended that study population demographics and patient characteristics be collected (Dworkin and LeResche, 1992).

Changes Over Time None

Procedure Method

Procedure Method Before using the RDC/TMD, the following TMD conditions should first be ruled out: muscle spasm, myositis, and contracture for Group I and polyarthridites, acute traumatic injuries, and joint infections for Group III. The defining criteria for these excluded TMD conditions are outlined in the following appendix for Axis I.

Axis I - Clinical TMD Conditions

In Axis I, a subject is assigned only one muscle diagnosis, that is, either myofascial pain or myofascial pain with limited opening, for Group I. For Group II, disc displacement, and Group III, arthralgia, arthritis, and arthrosis, each joint (i.e., the right and left) is assigned only one diagnosis for each group. For Group II, the diagnoses are disc displacement with reduction; disc displacement without reduction, with limited opening; and disc displacement without reduction, without limited opening. For Group III, the diagnoses are arthralgia, osteoarthritis of the TMJ, and osteoarthrosis of the TMJ. The diagnoses within a given group are mutually exclusive, and they can range from zero (i.e., no muscle or joint conditions) to five (i.e., one muscle diagnosis and plus one diagnosis from Groups II and III for each joint) per subject; however, more than three diagnoses are very rare (Dworkin and LeResche, 1992).

Each diagnostic criterion below is assessed by using specific TMD examination directions accompanied by the RDC Examination Form, signified by the letter "E" within the parentheses, and the RDC History Questionnaire, denoted by the letter "Q" in the parentheses. The diagnostic criteria for Axis I are:

Group I: Muscle Disorders

Muscle disorders include both painful and nonpainful disorders. This classification deals only with the most common painful disorders associated with TMD. In using the classification, the following uncommon conditions should first be ruled out: muscle spasm, myositis, and contracture. Criteria for these disorders are included in an appendix at the end of Axis I criteria.

I.a. Myofascial Pain: Pain of muscle origin, including a complaint of pain as well as pain associated with localized areas of tenderness to palpation in muscle.
   1. Report of pain or ache in the jaw, temples, face, preauricular area, or inside the ear at rest or during function (Q 3); plus
   2. Pain reported by the subject in response to palpation of three or more of the following 20 muscle sites (right side and left side count as separate sites for each muscle): posterior temporalis, origin of masseter, body of masseter, insertion of masseter, posterior mandibular region, submandibular region, lateral pterygoid area, and tendon of the temporalis. At least one of the sites must be on the same side as the complaint of pain (E 1, 8, 10).

I.b. Myofascial Pain With Limited Opening: Limited movement and stiffness of the muscle during stretching in the presence of myofascial pain.

1. Myofascial pain as defined in I.a; plus
2. Pain-free unassisted mandibular opening of less than 40 mm (E 4a, 4d); plus
3. Maximum assisted opening (passive stretch) of 5 or more mm greater than pain-free unassisted opening (E 4a, 4c, 4d).

Group II: Disc Displacements

II.a. Disc Displacement With Reduction: The disc is displaced from its position between the condyle and the eminence to an anterior and medial or lateral position, but reduces on full opening, usually resulting in a noise. Note that when this diagnosis is accompanied by pain in the joint, a diagnosis of arthralgia (III.a) or osteoarthritis (III.b) must also be assigned.

1. Either:
    a. Reciprocal clicking in TMJ (click on both vertical opening and and closing that occurs at a point at least 5 mm greater interincisal distance on opening than on closing and is eliminated on protrusive opening), reproducible on two of three consecutive trials (E 5); or
    b. Click in TMJ on both vertical range of motion (either opening or closing), reproducible on two of three consecutive trials, and click during lateral excursion or protrusion, reproducible on two of three consecutive trials (E 5a, 5b, 7).

II.b. Disc Displacement Without Reduction, With Limited Opening: A condition in which the disc is displaced from normal position between the condyle and the fossa to an anterior and medial or lateral position, associated with limited mandibular opening.

1. History of significant limitation in opening (Q 14, both parts); plus
2. Maximum unassisted opening less than or equal to 35 mm (E 4b, 4d); plus
3. Passive stretch increases opening by 4 mm or less over maximum unassisted opening (E 4b, 4c, 4d); plus
4. Contralateral excursion less than 7 mm and/or uncorrected deviation to the ipsilateral side on opening (E 3, 6a or 6b, 6d); plus
5. Either: (a) absence of joint sounds, or (b) presence of joint sounds not meeting criteria for disc displacement with reduction (see II.a) (E 5, 7).

II.c. Disc Displacement Without Reduction, Without Limited Opening: A condition in which the disc is displaced from its position between the condyle and the eminence to an anterior and medial or lateral position, not associated with limited opening.

1. History of significant limitation of mandibular opening (Q 14 both parts); plus
2. Maximum unassisted opening greater than 35 mm (E 4b, 4d); plus
3. Passive stretch increases opening by 5 mm or more over maximum unassisted opening (E 4b, 4c, 4d); plus
4. Contralateral excursion greater than or equal to 7 mm (E 6a or 6b, 6d); plus
5. Presence of joint sounds not meeting criteria for disc displacement with reduction (see II.a) (E 5, 7).
6. (In those studies that allow imaging, the following imaging criteria should also be met. The investigator should report whether the diagnosis was made with imaging or on the basis of clinical and history criteria only.)

Imaging conducted by either arthrography or MRI reveals displacement of disc without reduction.

a. Arthrography: (1) In intercuspal occlusal position, the anterior compartments appear larger and markedly more filled with contrast medium than in a normal joint; (2) on opening, significant contrast medium is retained anteriorly.

b. MRI: (1) In intercuspal occlusal position, the posterior band of the disc is located clearly anterior to the 12:00 position, at least at the 11:30 position; (2) on full opening, the posterior band remains clearly anterior to the 12:00 position.

Group III: Arthralgia, Arthritis, Arthrosis

In making diagnoses of disorders in this group, polyarthridites, acute traumatic injuries, and infections in the joint should first be ruled out.

III.a. Arthralgia: Pain and tenderness in the joint capsule and/or the synovial lining of the TMJ.

1. Pain in one or both joint sites (lateral pole and/or posterior attachment) during palpation (E 9); plus
2. One or more of the following self-reports of pain: pain in the region of the joint, pain in the joint during maximum unassisted opening, pain in the joint during assisted opening, pain in the joint during lateral excursion (E 2, 4b, 4c, 4d, 6a, 6b).
3. For a diagnosis of simple arthralgia, coarse crepitus must be absent (E 5, 7).

III.b. Osteoarthritis of the TMJ: Inflammatory condition within the joint that results from a degenerative condition of the joint structures.

1. Arthralgia (see III.a); plus
2. Either a or b (or both):
   a. Coarse crepitus in the joints (E 5, 7).
   b. Imaging - Tomograms show one or more of the following: erosion of normal cortical delineation, sclerosis of parts or all of the condyle and articular eminence, flattening of joint surfaces, osteophyte formation.

III.c. Osteoarthrosis of the TMJ: Degenerative disorder of the joint in which joint form and structure are abnormal.

1. Absence of all signs of arthralgia, i.e., absence of pain in the region of the joint, and absence of pain in the joint on palpation, during maximum unassisted opening, during maximum assisted opening, and on lateral excursions (see III.a); plus
2. Either a or b (or both):
   a. Coarse crepitus in the joint (E 5, 7).
   b. Imaging - Tomograms show one or more of the following: erosion of normal cortical delineation, sclerosis of parts or all of of the condyle and articular eminence, flattening of joint surfaces, osteophyte formation.

Appendix to Axis I: Ruling Out Muscle and Joint Conditions Prior to Use of RDC

I. Muscle Spasm, Myositis, and Contracture.

While diagnostic criteria for muscle spasm, myositis, and contracture are not precise, the following general guidelines are offered: muscle spasm is characterized by continuous muscle contraction; myositis is characterized by generalized tenderness in a specific muscle associated with known trauma or infection; contracture is characterized by limited range of motion with unyielding firmness on passive stretch. These criteria are less specific than those offered for the major RDC categories because of the lack of research on these less common conditions.

II. Polyarthridites, Acute Traumatic Injury.
Cases with TMJ arthralgia and symptomatic involvement of other joints in the body without evidence of traumatic causality should be classified by a rheumatologist with respect to the presence or absence of a specific polyarthritic condition, such as rheumatoid arthritis, juvenile rheumatoid arthritis, crystal-induced joint diseases, Lyme disease, or other relatively rare systemic conditions affecting joints. Because of the lack of a well-defined approach to diagnosis and the limited efficacy of the available diagnostic tests, different rheumatologists may use different criteria to define the presence or absence of such polyarthritides. The rheumatologist's diagnosis should be regarded as the "gold standard." Cases with a diagnostic label of systematic polyarthritic involvement should not be pooled with any of the subentities listed under "Other Joint Conditions." A screening item for polyarthritides is included as question 16 of the questionnaire. If either part a or part b of question 16 is answered "yes," or if both part c and part d of question 16 are answered "yes," the case should be classified by a rheumatologist with respect to the presence or absence of systemic arthritic diseases.

Acute cases of traumatic exposure to either the face or jaw should be examined for possible acute traumatic TMJ arthropathy. The clinical picture is characterized by pain and tenderness of the affected TMJ, limited range of motion due to pain, and lack of or reduced tooth contacts on the affected side due to increased intra-articular pressure. This diagnostic category is not to be included in any of the subentities listed under "Other Joint Conditions." A screening item for acute traumatic arthritis is included as question 17 of the questionnaire.

Source: Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord. 1992 Fall;6(4):301-55.

Axis II - Pain-Related Disability and Psychological Status

Axis II, as previously stated, measures chronic pain dysfunction (i.e., pain intensity and pain-related disability), depression and nonspecific physical symptoms, and the ability to the use the jaw.

For chronic pain dysfunction, a seven-item questionnaire introduced by Von Korff et al. is utilized for grading the severity of pain. These seven questions are Question 7 through Question 13 on the RDC History Questionnaire (see below). Pain intensity is determined from Questions 7 through 9 and pain-related disability from Questions 10 through 13. The scoring and classification criteria for grading chronic pain dysfunction are as follows:

Scoring Criteria:

Characteristic Pain Intensity - scored from 0 to 100 (i.e., Questions 7 - 9)

Mean [Pain Right Now, Worst Pain, Average Pain] x 10

Disability Score - scored from 0 to 100 (i.e., Questions 11 - 13)
Mean [Daily Activities, Social Activities, Work Activities] x 10

Disability Points - Add the points for Disability Days (i.e., Question 10) and the Disability Score above

Disability Points

Disability Days (0 - 180)		Disability Score (0 - 100)	
0 - 6 Days	0 Points	0 - 29	0 Points
7 - 14 Days	1 Point	30 - 49	1 Point
15 - 30 Days	2 Points	50 - 69	2 Points
31+ Days	3 Points	70+	3 Points

Classification Criteria:

Grade 0 No TMD pain in the prior 6 months

Grade I Low Disability - Low Intensity Pain
Criteria: Characteristic Pain Intensity less than 50, and less than 3 Disability Points

Grade II Low Disability - High Intensity Pain
Criteria: Characteristic Pain Intensity greater than or equal to 50, and less than 3 Disability Points

Grade III High Disability - Moderately Limiting
Criteria: 3 to 4 Disability Points, regardless of Characteristic Pain Intensity

Grade IV High Disability - Severely Limiting
Criteria: 5 to 6 Disability Points, regardless of Characteristic Pain Intensity

Source: Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord. 1992 Fall;6(4):301-55.

For depression and nonspecific physical symptoms, the Symptom Checklist 90-Revised (SCL-90-R) developed by Derogatis et al. is used. The SCL-90-R consists of a depression, vegetative symptoms, and additional items scale and a somatization scale (i.e., nonspecific physical symptoms). The SCL-90-R subscales appear as Question 20 on the RDC History Questionnaire (see below). The depression and vegetative symptom questions are b, e, h, i, k, l, m, n, v, y, cc, dd, and ee; the additional item questions are f, g, q, z, aa, bb, and ff; and the questions pertaining to nonspecific physical symptoms are a*, c, d*, j*, o*, p*, f, a , w, x. The questions with an asterisk are not included when scoring nonspecific physical symptoms with pain items excluded. When scoring the SCL-90-R scales, the raw mean scale score is used. The raw mean score is calculated by adding the score for all items answered and dividing by the total number of items answered. If less than two-thirds of the items are answered, the scale score is set to missing. The scoring and classification criteria for the SCL-90-R are as follows:

Scoring Criteria:

	Normal	Moderate	Severe
Depression (including vegetative symptoms)	<0.535	0.535 to <1.105	1.105+
Nonspecific Physical Symptoms (pain items included)	<0.500	0.500 to <1.000	1.000+
Nonspecific Physical Symptoms (pain items not included)	<0.428	0.428 to <0.857	0.857+

Classification Criteria:

Normal
Moderate (i.e., above the seventieth percentile on population norms)
Severe (i.e., above the ninetieth percentile on population norms)

Source: Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord. 1992 Fall;6(4):301-55.

RDC History Questionnaire

Please read each question and respond accordingly. For each of the questions below, indicate only one response.

1. Would you say your health in general is excellent, very good, good, fair, or poor?
   Excellent (1) Very good (2) Good (3) Fair (4) Poor (5)

2. Would you say your oral health in general is excellent, very good, good, fair, or poor?
   Excellent (1) Very good (2) Good (3) Fair (4) Poor (5)

3. Have you had pain in the face, jaw, temple, in front of the ear, or in the ear in the past month?
   No (0) Yes (1)

   [If no pain in the past month SKIP to question 14]

4a. How many years ago did your facial pain begin for the first time? __ __ years
   [If one year ago or more SKIP to question 5]
   [If less than one year ago, code 00]

4b. How many months ago did your facial pain begin for the first time? __ __ months

5. Is your facial pain persistent, recurrent, or was it only a one-time problem?
   Persistent (1) Recurrent (2) One-Time (3)

6. Have you ever gone to a physician, dentist, chiropractor, or other health professional for facial ache or pain?

No (1) Yes, in the last 6 months (2) Yes, more than 6 months ago (3)

7. How would you rate your facial pain on a 0 to 10 scale at the present time, that is right now, where 0 is "no pain" and 10 is "pain as bad as could be"?

8. In the past six months, how intense was your worst pain, rated on a 0 to 10 scale where 0 is "no pain" and 10 is "pain as bad as could be"?

9. In the past six months, on average, how intense was your pain, rated on a 0 to 10 scale where 0 is "no pain" and 10 is "pain as bad as could be"? [That is, your usual pain at times you were experiencing pain].

10. About how many days in the last 6 months have been kept from your usual activities (work, school, or housework) because of facial pain? _______ days

11. In the past six months, how much has facial pain interfered with your daily activities rated on a 0 to 10 scale where 0 is "no interference" and 10 is "unable to carry on any activities"?

12. In the past six months, how much has facial pain changed your ability to take part in recreational, social and family activities where 0 is "no change" and 10 is "extreme change"?

13. In the past six months, how much has facial pain changed your ability to work (including housework) where 0 is "no change" and 10 is "extreme change"?

14a. Have you ever had your jaw lock or catch so that it won't open all the way?

No (0) Yes (1)

[If no problem opening all the way SKIP to question 15]

14b. Was this limitation in jaw opening severe enough to interfere with your ability to eat?

No (0) Yes (1)

15a. Does your jaw click or pop when you open or close your mouth or when chewing?

No (0) Yes (1)

15b. Does your jaw make a grating or grinding noise when it opens and closes or when chewing?

No (0) Yes (1)

15c. Have you been told, or do you notice, that you grind your teeth or clench your jaw while sleeping at night?

No (0) Yes (1)

15d. During the day, do you grind your teeth or clench your jaw?

No (0) Yes (1)

15e. Does your jaw ache or feel stiff when you wake up in the morning?

No (0) Yes (1)

15f. Do you have noises or ringing in your ears?

No (0) Yes (1)

15g. Does your bite feel uncomfortable or unusual?

No (0) Yes (1)

16a. Do you have rheumatoid arthritis, lupus, or any other systemic arthritic disease?

No (0) Yes (1)

16b. Do you know of anyone in your family who has had any of these diseases?

No (0) Yes (1)

16c. Have you had or do you have any swollen or painful joint(s) other than the joints close to your ears (TMJ)?

No (0) Yes (1)

[If no swollen or painful joints, SKIP to question 17a.]

If Yes,

16d. Is this a persistent pain that you have had for at least one year?

No (0) Yes (1)

17a. Have you had a recent injury to your face or jaw?

No (0) Yes (1)

[If no recent injuries SKIP to question 18]

If Yes,

17b. Did you have jaw pain before the injury ?

No (0) Yes (1)

18. During the last 6 months have you had a problem with headaches or migraines?

No (0) Yes (1)

19. What activities does your present jaw problem prevent or limit you from doing? Indicate: No (0) Yes (1)

a. Chewing
b. Drinking
c. Exercising
d. Eating hard foods
e. Eating soft foods
f. Smiling/laughing
g. Sexual activity
h. Cleaning teeth or face
i. Yawning
j. Swallowing

k. Talking
l. Having your usual facial appearance

For the following indicate: Not at all A little bit Moderately Quite a bit Extremely

For the following indicate:	Not at all	A little bit	Moderately	Quite a bit	Extremely
	0	1	2	3	4

20. In the last month, how much have you been distressed by

a. Headaches
b. Loss of sexual interest or pleasure
c. Faintness or dizziness
d. Pains in the heart or chest
e. Feeling low in energy or slowed down
f. Thoughts of death or dying
g. Poor appetite
h. Crying easily
i. Blaming yourself for things
j. Pains in the lower back
k. Feeling lonely
l. Feeling blue
m. Worrying too much about things
n. Feeling no interest in things
o. Nausea or upset stomach
p. Soreness of your muscles
q. Trouble falling asleep
r. Trouble getting your breath
s. Hot or cold spells
t. Numbness or tingling in parts of your body
u. A lump in your throat
v. Feeling hopeless about the future
w. Feeling weak in parts of your body
x. Heavy feelings in your arms or legs
y. Thoughts of ending your life
z. Overeating
aa. Awakening in the early morning
bb. Sleep that is restless or disturbed
cc. Feeling everything is an effort
dd. Feelings of worthlessness
ee. Feeling of being caught or trapped
ff. Feelings or guilt

21. How good a job do you feel you are doing in taking care of your health overall?
Excellent (1) Very good (2) Good (3) Fair (4) Poor (5)

22. How good a job do you feel you are doing in taking care of your oral health?
Excellent (1) Very good (2) Good (3) Fair (4) Poor (5)

23. When were you born? Month ____ Day ____ Year ____

24. Are you male or female? Male (1)   Female (2)

25. Which of the following groups best represent your race?
 Aleut, Eskimo or American Indian (1)
 Asian or Pacific Islander (2)
 Black (3)
 White (4)
 Other (5) _________ (please specify)

26. Are any of these groups your national origin or ancestry?
 Puerto Rican (1)
 Cuban (2)
 Mexican/Mexicano (3)
 Mexican American (4)
 Chicano (5)
 Other Latin American (6)
 Other Spanish (7)
 None of the above (8)

27. What is the highest grade or year of regular school that you have completed?
 Never attended or 00
 Kindergarten
 Elementary School: 1   2   3   4   5   6   7   8
 High School: 9   10   11   12
 College: 13   14   15   16   17   18+

28a. During the past 2 weeks, did you work at a job or business not counting work around the house (include unpaid
 work in the family farm/business?   Yes (1)   No (2)

 [If Yes SKIP to question 29]

 If No,
28b. Even though you did not work during the past 2 weeks, did you have a job or business? Yes (1)   No (2)

 [If Yes SKIP to question 29]

 If No,
28c. Were you looking for work or on layoff from a job during those 2 weeks?
 Yes, looking for work (1)
 Yes, layoff (2)
 Yes, both on layoff and looking for work (3)
 No (4)

29. What is your marital status?
 Married spouse in household (1)
 Married spouse not in houshold (2)

Widowed (3)
Divorced (4)
Separated (5)
Never Married (6)

30. Which of the following best represents your total combined household income during the past 12 months?
$0 - $14,999
$15,000 - $24,999
$25,000 - $34,999
$35,000 - $49,999
$50,000 - more

31. What is your 5-digit zip code? ___ ___ ___ ___ ___

Source: Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord. 1992 Fall;6(4):301-55.

For determining the ability to the use the jaw, a brief Jaw Disability Checklist is used to evaluate whether current jaw problems prevent or limit the subject from doing twelve activities such as swallowing, drinking, talking, or chewing. According to the developers and recent research, there is no indication of a proposed classification system, and the validity and reliability of the checklist has not been evaluated.

Jaw Disability Checklist

What activities does your present jaw problem prevent or limit you from doing: For each, indicate: No (0) Yes (1)

Chewing
Drinking
Exercising
Eating hard foods
Eating soft foods
Smiling/laughing
Sexual activity
Cleaning teeth or face
Yawning
Swallowing
Talking
Having your usual facial appearance

Source: Dworkin SF, LeResche L. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. J Craniomandib Disord. 1992 Fall;6(4):301-55.

Established Modifications

To date, there haven't been any modifications to the RDC/TMD per se; however, there was a Swedish translation formulated, specifically to the RDC History Questionnaire, and a modification of seven demographic questions that were compared to the original U.S. English version. And, as a result, the Swedish version was determined to be valuable in helping to classify TMJ patients and obtaining multicenter and cross-cultural comparisons of the clinical findings (List and Dworkin, 1996).

Federal Survey Modifications

None

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Root Caries Index

Procedure & Method Information

Name of Procedure/Method Root Caries Index

Abbreviation RCI

Purpose To assess the prevalence of root caries.

Year of Establishment 1980

Type of Procedure/Method

Developer(s) R.V. Katz

Oral Condition Category

Background Information

Background Information

The Root Caries Index (RCI), first described in 1980 by R.V. Katz, was intended to make the simple prevalence measures for root caries more specific by including the concept of teeth at risk for root caries (Katz, 1980; Burt and Eklund, 1999). A tooth was considered "at risk" if enough gingival recession had occurred to expose part of the cemental surface to the oral environment. However, approximately 15 percent of all root surface lesions have occurred on surfaces with no gingival recession, although loss of periodontal attachment was present (Burt and Eklund, 1999).

The Index can be computed for an individual, for particular tooth types, or for a population at large (Burt and Eklund, 1999).

Changes Over Time

The original description of RCI acknowledged the chance of underestimation due to the exclusion of subgingival lesions since these types of lesions were considered unusual at the time. However, approximately 15 percent or more of root lesions are subgingival (Burt and Eklund, 1999). So, now it is recommended that the RCI be applied to both supragingival and subgingival lesions, but the scores for each type should be recorded separately when studying disease distribution, etiology, and risk factors (Burt and Eklund, 1999; Katz, 1996). This recommendation is made because it has not been determined whether subgingival lesions are etiologically distinct from supragingival lesions and because of the difficulties in finding the subgingival lesions.

According to R.V. Katz, the only time the subgingival and supragingival scores should be combined into a common index is when estimates of treatment needs are being studied (Katz, 1996).

Procedure Method

Procedure Method

To obtain the RCI, each of the four surfaces, the mesial, distal, buccal (labial), and lingual, of a root are examined for a single tooth. All teeth are examined in both the lower and upper arch. For teeth with multiple roots (i.e., two or three roots) and extreme recession, it is the suggested rule that when multiple types of root surfaces are exposed, the most severely affected root surface be recorded for that tooth, even though this occurrence is judged to be rare (Katz, 1980).

The root surfaces are characterized and recorded as missing (M); showing no association with gingival recession (NoR); recession present, surface decayed (R-D); recession present, surface filled (R-F); or recession present, surface normal or sound (R-N). A designation of missing (M) is made for the whole tooth and not for a single surface. Therefore, once a tooth is observed to be missing, all the root surfaces are recorded as missing. A judgement of no recession (NoR) is made if the cementoenamel junction (CEJ) cannot be observed. In addition, if calculus is present in the absence of any other findings on a recessed root surface, a judgement of sound (R-N) is made on the assumption that decay is not found underneath the band of calculus (Katz, 1980).

Once the above information is collected and recorded, as illustrated in the following formula, the RCI is obtained by adding the number of root lesions and restorations and dividing that number by number of root surfaces with gingival recession in decayed, filled, and sound teeth.

RCI = (No. of root surfaces: decayed (R-D) + filled (R-F)/No. of root surfaces with gingival recession: decayed (R-D) + filled (R-F) + sound (R-N)) x 100

For example, a RCI of 10% means that among all teeth with gingival recession, 10% were decayed or filled on the root surfaces.

Established Modifications None

Federal Survey Modifications None

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Russell's Index (See Periodontal Index)

Procedure & Method Information

Name of Procedure/Method Russell's Index (See Periodontal Index) *Abbreviation*

Purpose

Year of Establishment *Type of Procedure/Method*

Developer(s) *Oral Condition Category*

Background Information

Background Information

Changes Over Time

Procedure Method

Procedure Method

Established Modifications

Federal Survey Modifications

References

References

Validaty

Reliability

Listing of Publications with Surveys &

Salivary Flow Rate Techniques

Procedure & Method Information

Name of Procedure/Method Salivary Flow Rate Techniques

Abbreviation N/A

Purpose To measure salivary flow.

Year of Establishment N/A

Type of Procedure/Method

Developer(s) N/A

Oral Condition Category

Background Information

Background Information

Saliva, similar to blood and urine, is a very valuable diagnostic agent for measures of salivary flow rate and composition. Human saliva is produced by three paired major salivary glands (i.e., the parotid, submandibular, and sublingual) and numerous minor glands. The parotid gland secretes saliva via the Stensen's ducts that are located on the buccal mucosa near the maxillary second molars, and the saliva from the submandibular and sublingual glands enters the oral cavity via the Wharton's ducts, located in the floor of the mouth. As previously mentioned, there are also several minor glands scattered throughout the mouth that are located on the buccal mucosa, the soft palate, and the inner surfaces of the lips.

Saliva can be obtained or collected under unstimulated (resting) or stimulated conditions. Unstimulated or resting saliva is referred to as the saliva collected with no apparent source of stimulation (Navazesh, 1993), whereas stimulated saliva is the collection of saliva induced by variety of agents or stimuli such as gustatory (tasting) and masticatory (chewing) stimuli. Gustatory (e.g., citric acid drops or paper) and masticatory (e.g., a standard-size gum base or paraffin wax) stimuli are the most frequently used stimulants to increase salivary flow. Pharmacologic and electrical stimulants have also been used as therapeutic agents for the management of salivary gland hypofunction (Navazesh, 1993).

Saliva also can be collected as whole saliva or from the individual glands. Whole saliva is the secretions from the major and minor salivary glands, and individual gland secretions are the saliva from the parotid, submandibular, and sublingual glands. According to the literature, for compositional analyses, the collection of individual gland secretions is better than whole saliva since whole saliva contains nonsalivary elements such as desquamated epithelial cells, food debris, bacteria, gingival crevicular fluid, and leukocytes (Navazesh, 1993). However, for assessment of overall salivary gland dysfunction, whole saliva is superior and clinically more relevant (Navazesh, 1993).

When collecting unstimulated or stimulated saliva, it is very important that the methods be standardized because salivary flow rates can vary among individuals and within the same individual under different conditions (e.g., hydration, seasonal, diurnal, duration of stimulation, and the nature of the stimulus). There are several methods for collecting whole saliva versus saliva from the individual glands.

For the collection of whole saliva, there are four conventional methods for assessing salivary flow. They are (1) the draining method, (2) the spit method, (3) the suction method, and (4) the swab method. According to the literature review, the draining and the spitting methods are both considered reliable or reproducible methods (Navazesh, 1993; Jones, Watkins, Hand, Warren, and Cowen, 2000). However, among examiners and subjects, the spitting method was the more preferred method over the draining method due its simplicity (Jones, Watkins, Hand, Warren, and Cowen, 2000). The spitting method is also recommended for stimulated whole saliva collection. The swab method was found to be the least reliable method (Navazesh, 1993; Jones, Watkins, Hand, Warren, and Cowen, 2000), and the suction method had the highest test-retest reliability and consistently yielded more saliva volume than the spitting or draining methods (Jones, Watkins, Hand, Warren, and Cowen, 2000).

For individual gland collection, the parotid gland saliva can be collected with a Lashley cup or a modified Carlson-Crittenden device. For the submandibular and sublingual glands, the saliva can be collected by tapered polyethylene tubing; custom-made collection devices, referred as segregators; and a micropipette with gentle suction. Minor gland secretions can be collected by pipette or absorbent filter paper or paper strips (Navazesh, 1993).

Changes Over Time

N/A

Procedure Method

Procedure Method

Regardless of the following collection methods, it is best to collect saliva while the subject is sitting comfortably upright with the head tilted slightly forward and the eyes open. Subjects should also refrain from smoking, eating, or drinking 1 to 2 hours prior to collection. For compositional analyses, the saliva should be collected into chilled tubes, kept on ice, and frozen until analysis.

Whole Saliva Collection Methods

For each method, the subject should first be instructed to rinse his/her mouth thoroughly with deionized water prior to the collection and to void the mouth of saliva. The subject should also be seated comfortably with the head tilted slightly forward, the eyes open, and for unstimulated saliva collection instructed to rest for 5 minutes and to minimize orofacial movements. Five minutes is an adequate collection time period. Prior to the actual collection period, it is recommended that the subject be familiarized with the method by running a 1- to 2-minute trial collection. For stimulated saliva, the first 2-minute collected sample should be discarded (Navazesh, 1993).

1. Draining method: Saliva is allowed to drip off the lower lip into a preweighed or graduated test tube fitted with a

funnel and the subject expectorates into the test tube at the end of the collection period.
2. Spitting method: Saliva is allowed to accumulate in the floor of the mouth and the subject spits the saliva out
into a preweighed or graduated test tube at specific time intervals (e.g., every 60 seconds).
3. Suction method: Saliva is continuously aspirated from the floor of the mouth via a vacuum suction device into a
preweighed container or test tube by a saliva ejector or an aspirator.
4. Swab (absorbent) method: Saliva is collected (absorbed) by a preweighed swab, cotton roll, or gauze sponge placed
in the mouth at the orifices of the major glands and is removed for reweighing at the end of the collection period.

Source: Navazesh M. Methods for collecting saliva. Ann N Y Acad Sci. 1993 Sep 20;694:72-7.

Individual Gland Collection Methods

As previously mentioned, for the parotid gland, a Lashley cup or modified Carlson-Crittenden device is used. The collector consists of a plastic or metal cup with an inner and outer chamber. The inner chamber is attached to plastic tubing that transports the saliva to the collection vessel, and the outer chamber is attached to a rubber bulb or suction-inducing device via the plastic tubing. The cup is placed over the Stensen's duct to obtain saliva. This method is considered simple and reliable (Navazesh, 1993).

For both the submandibular and sublingual glands, the secretions often enter the oral cavity via the Wharton's duct, so it is difficult to isolate the saliva from each gland separately. However, tapered polyethylene tubing, with extreme caution not to cause the thin duct walls to rupture, may be used for cannulation of the Wharton's duct and for collection of submandibular saliva. Segregators with a central chamber for the submandibular saliva collection and one or two lateral chambers for the collection of sublingual saliva may also be used. Despite the ease of this collection method, the manufacture of these segregators or custom-made devices is time-consuming because a mold of the floor of the subject's mouth has to made and the device has to be made and adjusted on an individual basis. This method is also inconvenient for individuals with inflammatory or ulcerative soft tissue disorders affecting the floor of the mouth (Navazesh, 1993). A more simple method for collecting mixed submandibular and sublingual saliva is the collection of saliva from the floor of mouth using the micropipette with gentle suction while the Stensen's ducts are blocked.

For minor salivary glands, the mucosa is dried first. After a specific time interval, the saliva may be collected by touching the developing beads of saliva with absorbent filter paper or paper strips. Secretions may also be collected with a pipette.

Saliva Measurement Techniques

There are three traditional methods for measuring saliva. They are (1) volume, (2) displacement, and (3) weight (White, 1977). For calculating salivary flow rates, the saliva weight is divided by the collection time, resulting in grams per minute units.

Established Modifications	N/A
Federal Survey Modifications	N/A

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Validaty

Reliability

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Mulligan R, Navazesh M, Wood GJ. A pilot study comparing three salivary collection methods in an adult population with salivary gland hypofunction. Spec Care Dentist. 1995 Jul-Aug;15(4):154-7.

Sickness Impact Profile

Procedure & Method Information

Name of Procedure/Method Sickness Impact Profile *Abbreviation* SIP

Purpose To assess self-perception of general and oral health status.

Year of Establishment 1975 *Type of Procedure/Method*

Developer(s) B.S. Gilson, M. Bergner, et al. *Oral Condition Category*

Background Information

Background Information

Initial development of the Sickness Impact Profile (SIP) began in 1972 by B.S. Gilson, M. Bergner, et al. After several revisions over six years, the final revision of the SIP was developed.

The final SIP, a behaviorally based health status instrument, consists of 136 items or statements pertaining to health-related dysfunctions in 12 different categories of daily living activity (i.e., sleep and rest, eating, work, home management, recreation and pastimes, ambulation, mobility, body care and movement, social interaction, alertness behavior, emotional behavior, and communication). A sample of these statements is located in the Procedure Method section. The original SIP, also referred to as the prototype SIP, and the second SIP revision, consisted of 312 items in 14 different categories and 189 items, respectively.

The Sickness Impact Profile is based on the concept of performance in which individuals perceive and describe their health in terms of their performance or behavior such as "not walking," "eating less," or "staying indoors" (Bergner, Bobbitt, Kressel, Pollard, Gilson, Morris, 1976). The SIP incorporates the concept of the dysfunctional continuum in which one's perception of health-sickness level is equated with level of function-dysfunction. Therefore, "healthy" individuals are thought of as behaving without limitation whereas "sick" individuals may be thought of as experiencing limitations and exhibiting dysfunction (Bergner, Bobbitt, Kressel, Pollard, Gilson, Morris, 1976; Damiano, 1996).

The SIP can be self- or interviewer-administered and is designed to be utilized on individuals as well as groups. As stated earlier, the SIP is divided into 12 areas of everyday activity. Among these 12 categories, seven are grouped into two domains or dimensions, physical (i.e., ambulation, mobility, body care and movement) and psychosocial (i.e., social interaction, alertness behavior, emotional behavior, and communication). The remaining five categories are considered independent categories (i.e., sleep and rest, eating, work, home management, and recreation and pastimes).

The SIP Model

Dimension (No. of Items)	Category (No. of Items)
Physical (45)	Ambulation (12) Mobility (10) Body Care & Movement (23)
Psychosocial (48)	Social Interaction (20) Alertness Behavior (10) Emotional Behavior (9) Communication (9)
Independent Categories (43)	Sleep and Rest (7) Eating (9) Work (9) Home Management (10) Recreation and Pastimes (8)

Source: Damiano AM. The Sickness Impact Profile: Part I. Medical Outcomes Trust Bulletin. 1996 March;4(2). Retrieved July 16, 2001, from the World Wide Web: http://www.outcomes-trust.org/bulletin/0396bull.htm.

The SIP has been extensively field tested by its developers, and as a result, it is simple, comprehensive, and user-friendly. It is also well validated in terms of construct, convergent, discriminant, and clinical validity and has demonstrated a high degree of reliability (i.e., reproducibility and internal consistency) (Bergner, Bobbitt, Carter, Gilson, 1981; Damiano, 1996).

The SIP is not only used for oral health-related research, but it has been widely accepted and used in over 40 health conditions (Damiano, 1996). Due to its wide usage and acceptance, it is also available in several languages. They are Chicano Spanish (i.e., Mexican-American), Danish, Dutch, English (United Kingdom), Finnish, French, Italian, Portuguese, Swedish, and Thai (Istituto Nazionale Tumori, 2001; Damiano, 1996). Despite the different translations, the Mexican-American and United Kingdom translations are the only versions that have been validated. The other translations are in various stages of testing (Damiano, 1996).

Changes Over Time None

Procedure Method

Procedure Method The SIP, as stated earlier, can be self-administered or administered by a trained interviewer. The questionnaire administration takes about 20 to 30 minutes to complete. When completing the SIP, respondents either endorse by saying "yes" to the trained interviewer or by placing a check mark on the self-administered form for only those statements that they are sure describe themselves on that given day and are related to their health. The 136 items or statements are simple, clear, and direct sentences that are phrased in the present tense. For further information, sample statements from each category are provided below for referencing.

Afterwards, for the total or overall SIP score, a percent score is calculated by adding the scale values of all items endorsed or checked and dividing that sum by the total sum of all scale values on the SIP, then multiplying the quotient by 100. Scoring can be based at the level of categories, dimensions, or the total SIP score and is calculated in the same manner. For example, for each category, the scale values for all items endorsed within a category are summed, divided by the sum of all scale values within that particular category, and multiplied by 100.

Sickness Impact Profile (SIP) - Categories and Selected Items

I. Physical

Ambulation (A)
I walk shorter distances or stop to rest often.
I do not walk at all.
Mobility (M)
I stay within one room.
I stay away from home only for brief periods of time.
Body Care and Movement (BCM)
I do not bathe myself at all but am bathed by someone else.
I am very clumsy in body movements.

II. Psychosocial

Social Interaction (SI)
I am doing fewer social activities with groups of people.
I isolate myself as much as I can from the rest of the family.
Alertness Behavior (AB)
I have difficulty reasoning and solving problems, for example, making plans, making decisions, learning
new things.
I sometimes behave as if I were confused or disoriented in place or time, for example, where I am, who is
around, directions, what day it is.
Emotional Behavior (EB)
I laugh or cry suddenly.
I act irritable and impatient with myself, for example, talk badly about myself, swear at myself, blame
myself for things that happen.
Communication (C)
I am having trouble writing or typing.
I do not speak clearly when I am under stress.

III. Independent Categories

Sleep and Rest (SR)
I sit during much of the day.
I sleep or nap during the day.
Eating (E)
I am eating no food at all, nutrition is taken through tubes or intravenous fluids.
I am eating special or different food.
Work (W)
I am not working at all.
I often act irritable toward my work associates.
Home Management (HM)
I am not doing any of the maintenance or repair work around the house that I usually do.
I am not doing heavy work around the house.
Recreation and Pastimes (RP)
I am going out for entertainment less.
I am not doing any of my usual physical recreation or activities.

Source: Bergner M, Bobbitt RA, Carter WB, Gilson BS. The Sickness Impact Profile: development and final revision of a health status measure. Med Care. 1981 Aug;19(8):787-805.

Established Modifications

Except for the several translations (i.e., Chicano Spanish, Danish, Dutch, English [United Kingdom], Finnish, French, Italian, Portuguese, Swedish, and Thai) previously mentioned in the Background section, there have been no modifications made to the standard SIP for assessment of general medical health status.

However, in 1989, S.T. Reisine and J. Weber modified the standard SIP to assess sickness behavior and the impact of oral health status on social functioning among a subgroup of dental patients. In this modified version only seven of the original 12 categories or subscales were included due to their relevance to dental problems. These seven subscales (i.e., 73-items) are rest and sleep, intellectual functioning, social interaction, home tasks, work, communication, and leisure activities. The other subscales were eliminated since they mainly entailed daily living activities such as dressing and self-care (Reisine and Weber, 1989). Similar to the original SIP, when scoring, a score is calculated for each subscale or category in addition to a total score. The scores range from 0 to 100 for each subscale and the total SIP.

Federal Survey Modifications

None

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Validaty

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Simplified Oral Hygiene Index

Procedure & Method Information

Name of Procedure/Method Simplified Oral Hygiene Index

Abbreviation OHI-S

Purpose To assess oral hygiene or cleanliness.

Year of Establishment 1964

Type of Procedure/Method

Developer(s) J.C. Greene and J.R. Vermillion

Oral Condition Category

Background Information

Background Information

The Simplified Oral Hygiene Index (OHI-S) was developed in 1964 by John C. Greene and Jack R. Vermillion, the developers of the original Oral Hygiene Index (OHI). Even though the original OHI was determined to be simple, sensitive, and useful, it was time-consuming and required more decision making. So, an effort was made to develop a more simplified version with equal sensitivity.

The OHI-S does not have as great a degree of sensitivity as the original OHI, but it is a more rapid method of evaluation because of the number of tooth surfaces scored (i.e., 6 rather than 12) (Greene and Vermillion, 1964). Other features that differ from the original OHI are the method of selecting the tooth surfaces to be scored and the scores that can be obtained. However, the criteria and scoring for the tooth surfaces remained the same. Like the OHI, the OHI-S has two components, the Simplified Debris Index (DI-S) and the Simplified Calculus Index (CI-S).

Changes Over Time None

Procedure Method

Procedure Method

Before calculating the DI-S and CI-S for OHI-S, six tooth surfaces are selected, four from the posterior region of the mouth and two from the anterior region.

In the posterior region, the first fully erupted tooth distal to the second bicuspid, usually the first molar, is examined on each side of each arch. Sometimes, however, it is the second or third molar. The buccal surfaces of the selected upper molars and the lingual surfaces of the selected lower molars are examined.

In the anterior region, the labial surfaces of the upper right and the lower left central incisors are examined. In the absence of either of these anterior teeth, the corresponding central incisor on the opposite side of the midline is substituted.

For the OHI-S, each surface, buccal or lingual, is considered half the tooth circumference. Also, only fully erupted permanent teeth are scored. A tooth is considered “fully erupted” when the occlusal or incisal surface has reached the occlusal plane. Natural teeth with full crown restorations and surfaces reduced in height by caries or trauma are not scored. An alternate tooth is examined instead.

After the six possible tooth surfaces are selected, then the scores are determined, recorded, and computed for the DI-S and CI-S, respectively.

The mouth is examined first for debris (i.e., DI-S). The surface area covered by debris is estimated by running the side of the No. 5 explorer (Shepard’s hook) along the tooth surface being examined. The occlusal or incisal extent of the debris is determined and recorded as it is removed. For the DI-S, the following scoring criteria are used:

Simplified Debris Index - Scoring and Criteria (Greene and Vermillion, 1964)

0 = No debris or stain present.
1 = Soft debris covering not more than one-third of the tooth surface being examined or the presence of extrinsic stains without debris regardless of surface area covered.
2 = Soft debris covering more than one-third but not more than two-thirds of the exposed tooth surface.
3 = Soft debris covering more than two-thirds of the exposed tooth surface.

Source: Greene JC, Vermillion JR. The simplified oral hygiene index. J Am Dent Assoc. 1964;68:7-13.

After the six possible debris scores are recorded, the DI-S value is calculated. After the debris score is obtained for each of the six possible preselected tooth surfaces for the DI-S, four from the posterior region and two from the anterior region, then the oral calculus is examined. The No. 5 explorer (Shepard’s hook) is used to estimate the surface area covered by the supragingival calculus and to probe for subgingival calculus. The following scoring codes and criteria are used for the CI-S:

Simplified Calculus Index - Scoring and Criteria (Greene and Vermillion, 1964)

0 = No calculus present.
1 = Supragingival calculus covering not more than one-third of the exposed tooth surface being examined.
2 = Supragingival calculus covering more than one-third but not more than two-thirds of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth.
3 = Supragingival calculus covering more than two-thirds of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth.

Source: Greene JC, Vermillion JR. The simplified oral hygiene index. J Am Dent Assoc. 1964;68:7-13.

For each individual, the debris and calculus scores are totaled and divided by the number of tooth surfaces scored. For an individual score to be calculated, at least two of the six possible tooth surfaces must have been examined. For a group of individuals, the debris and calculus scores are obtained by calculating the average of the individual scores. The average individual or group score is the DI-S or the CI-S. Individual scores are calculated to one decimal place, and group scores may be calculated to one or two decimal places, depending on the sample size and use of the data (Greene and Vermillion, 1964).

Once the DI-S and CI-S are calculated separately, then they are combined or added together for the OHI-S. The DI-S and CI-S values range from 0 to 3, and OHI-S value ranges from 0 to 6.

Established Modifications None

Federal Survey Modifications None

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Validaty

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Soft Tissue Procedures in the National Health and Nutrition Examination Survey (NHANES) III

Procedure & Method Information

Name of Procedure/Method Soft Tissue Procedures in the National Health and Nutrition Examination Survey (NHANES) III

Abbreviation N/A

Purpose To assess the prevalence of selected pathological conditions affecting the oral mucosa (i.e., soft tissue).

Year of Establishment N/A

Type of Procedure/Method

Developer(s) National Center for Health Statistics (NCHS), United States

Oral Condition Category

Background Information

Background Information

Due to the existence and broad range of several soft tissue-related diseases and disorders, in the National Health and Nutrition Examination Survey (NHANES) III, 1988-1994, the oral mucosa or soft tissue clinical assessment included only selected pathological conditions or lesions based on the frequency of occurrence, clinical significance, and ability to be diagnosed by clinical methods alone.

These lesions or conditions are (1) actinic keratosis, (2) acute necrotizing ulcerative gingivitis, (3) amalgam tattoo, (4) angular cheilitis, (5) candidiasis (i.e., acute pseudomembranous and acute erythematous), (6) cheek/lip biting, (7) denture-related lesions (i.e., denture hyperplasia, denture stomatitis, and denture ulcer), (8) erythroplakia, (9) frictional white lesion, (10) galvanic white lesion, (11) gingival hyperplasia, (12) herpes labialis, (13) herpetic gingivostomatitis, (14) leukoplakia, (15) lichen planus, (16) mucocele, (17) nevus, (18) nicotinic stomatitis, (19) papillomas/warts, (20) recurrent aphthous ulceration, (21) smokeless tobacco lesion, (22) tongue lesions (i.e., fissured tongue, geographic tongue, glossitis [nonspecific], hairy tongue, and median rhomboid glossitis), (23) tumor (nonspecific) lesions, and (24) ulcer (nonspecific) lesions. There was also an optional category for unknown lesions.

For children and adolescents, the clinical exam also gave special consideration to detecting soft tissue conditions resulting from the use of smokeless tobacco and associated with cancer, precancer, conditions predisposed to cancer, denture wearing, and tobacco use for adults. In addition to the clinical assessment, a household questionnaire was used to collect information about risk factors such as the use of smokeless tobacco, smoking tobacco, and alcohol.

The findings for the NHANES III soft tissue assessment can also be compared with the findings from the National Institute of Dental Research (NIDR) National Survey of Oral Health in U.S. School Children, 1986-87.

Changes Over Time N/A

Procedure Method

Procedure Method

The soft tissue exam was conducted on sample persons 2 years old and older. As outlined in NHANES III, the clinical procedure for the soft tissue assessment is as follows:

NHANES III Oral Mucosal Tissue Examination Procedure

Using two mouth mirrors and two 2x2 gauze squares, the examination procedure follows a systematic assessment of the lips; labial mucosa and sulcus; commissures, buccal mucosa, and sulcus; gingiva and alveolar ridges, tongue; floor of the mouth; and hard and soft palates.

1. Begin examination by observing the lips with the mouth both closed and open. Note the color, texture, and any
surface abnormalities of the upper and lower vermilion borders.

2. With the mouth partially open, visually examine the labial mucosa and sulcus of:
a. the maxillary vestibule and frenulum, and
b. the mandibular vestibule.

Observe the color and any swelling or other abnormalities of the vestibular mucosa and gingiva.

3. Using the two mouth mirrors as retractors and with the mouth open wide, examine first the right, then the left
buccal mucosa extending from the labial commissures and back to the anterior tonsillar pillar. Note any change
in pigmentation, color, texture, mobility, and other abnormalities of the mucosa; make sure that the commissures
are examined carefully and are not covered by the mouth mirrors during retraction of the cheek.

4. Next, examine the gingiva and alveolar ridges (processes).

a. Buccal and Labial Aspects

Start with the right maxillary posterior gingiva and alveolar ridge and move around the arch to the left posterior
gingiva. Continue with the left mandibular posterior gingiva and alveolar ridge and move around the arch to the
right posterior gingiva.

b. Palatal and Lingual Aspects

Same as above except on the palatal for the maxillary (right to left) examination and on the lingual for the
mandibular (left to right) examination.

5. With the tongue at rest and mouth partially open, inspect the dorsum of the tongue for any swelling, ulceration, coating, or variation in size, color, or texture. Also note any change in the pattern of the papillae covering the surface of the tongue and examine the top and the tip of the tongue. The subject should then protrude the tongue, and the examiner should note any abnormality of mobility. With the aid of mouth mirrors, inspect the margins of the tongue. Grasping the tip of the tongue with a piece of gauze will assist full protrusion and will aid examination of the margins. Then observe the ventral surface.

6. With the tongue still elevated, inspect the floor of the mouth for swellings or other abnormalities.

7. With the mouth wide open and the subject's head tilted backward, gently depress the base of the tongue with a mouth mirror. First inspect the hard and then the soft palate.

Mucosal or facial tissues that seem to be abnormal should be palpated.

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey III, 1988-1994. Washington, DC: U.S. Government Printing Office.

In regard to recording the findings, only one lesion or condition per subject was recorded on a form. If more than one condition or lesion was observed, then an additional form was used. The recording form consisted of three major sections: an oral cavity diagram for specifying lesion location, a section for the clinical diagnosis, and a section for the lesion clinical description. There was also a space for indicating whether the lesion had been smeared. Smears were taken for the following conditions: angular cheilitis, candidiasis, denture stomatitis, erythroplakia, leukoplakia, lichen planus, and median rhomboid glossitus.

Other procedural guidelines for the soft tissue assessment are provided below.

A. Location

On the diagram provided, identify the topographic location and mark the nearest circle(s) in the appropriate areas. If the condition is generalized, mark the circle labeled "generalized."

B. Clinical Diagnosis

All conditions will be recorded either as a definitive diagnosis or as unknown.

1. When a clinical diagnosis can be made, then check the appropriate lesion or write in the name of the lesion in the space following "other" if it is not one of the listed lesions but you are sure of the diagnosis.

2. If a clinical diagnosis cannot be made, then check "unknown."

C. Clinical Description

For the following lesions the clinical description portion of the form will be completed: candidiasis, erythroplakia, hairy leukoplakia, leukoplakia, lichen planus, tumors, ulcers, and unknowns.

1. Presentation: Mark whether the lesion is single, multifocal, or generalized.

2. Size

a. Single lesions

Record length and width in millimeters for flat lesions. For elevated lesions also record the height.

b. Multifocal lesions

Record size of largest single lesion as described above.

c. Generalized conditions

Size need not be specified.

3. Surface Morphology

Check the most appropriate surface morphology. If the lesion has multiple components, record the appearance of the predominant component. If the morphology is different from those listed on the form, describe the morphology under "other."

4. Colors

Specify the predominant color. If the lesion is a color other than those on the form, specify the predominant color under "other." If no single color predominates, check as many colors as apply.

5. Consistency

For lesions that can be palpated, check the appropriate consistency: soft, firm, fluid-filled, or other. If the consistency is different from those listed, specify under "other."

6. Pain

Ask the subject whether the lesion in question is painful at the present time, and record the response.

7. Duration

Ask about the duration of the lesion in question and mark the form accordingly. If the duration is not known, leave this item blank.

8. Prior History

Inquire if the subject has had a similar lesion in the past and specify "yes," "no," or "unknown" in the space provided.

9. Comments

If the examiner wants the recorder to record additional information, it should be recorded in the comments section. Only the lower 1/2 inch of the second page should be used to write comments.

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey III, 1988-1994. Washington, DC: U.S. Government Printing Office.

Established Modifications N/A

Federal Survey Modifications N/A

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Validaty

Reliability

Listing of Publications with Surveys &

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National Center for Health Statistics. National Health and Nutrition Examination Survey III, 1988-1994. Washington, DC: U.S. Government Printing Office.

Streptococcus Mutans Testing

Procedure & Method Information

Name of Procedure/Method Streptococcus Mutans Testing

Abbreviation N/A

Purpose To aid in the assessment of dental caries risk.

Year of Establishment N/A

Type of Procedure/Method

Developer(s) N/A

Oral Condition Category

Background Information

Background Information

Many studies, including longitudinal studies, have shown that there is correlation between caries experience and the amount of Streptococcus mutans (S. mutans) in the saliva or plaque. For example, individuals with low counts of S. mutans usually have low caries scores, whereas individuals with high counts of S. mutans have high caries scores. This is why counts of S. mutans have been used in the assessment of caries risk. However, due to the fact that caries is a multifactorial disease, bacterial counts alone cannot sufficiently determine risk of caries. Therefore, bacterial tests should be combined with other clinical findings or test results in the prediction of future caries.

Changes Over Time N/A

Procedure Method

Procedure Method

Several methods are available to measure the level of S. mutans in saliva and plaque or on the individual tooth surface. These methods can either be done by using laboratory facilities or by chair-side test.

For the laboratory method, saliva or dental plaque is collected from the individual and transported in a special medium to the laboratory. After incubation on agar plates using a selective medium, such as Mitis salivarius bacitracin (MSB) agar, the S. mutans colonies on the plates are counted and the results are recorded as number of colony-forming units per milliliter of saliva. The agar plates have a shelf life of about 1 week. With the exception of the rare serotype a, all types of S. mutans strains grow on this type of selective medium.

For the chair-side test, a popular one is the Strip Mutans test; it is based on the ability of S. mutans to grow on a solid surface in combination with a selective broth containing a high sucrose concentration along with bacitracin. As the bacitracin is added to the broth just before use, the shelf life of the test can be prolonged considerably. Afterwards, to determine the individual's amount of S. mutans, the S. mutans is given a classification level once it is compared to the chart supplied by manufacturer. One popular brand is the Dentocult SM Strip Mutans test.

Other chair-side tests include the Mucount test, the Cariescreen test, and the Latex Agglutination (LA) test. In comparison to laboratory-based methods, the chair-side test is a reliable evaluation method that is simple and less time-consuming.

Established Modifications N/A

Federal Survey Modifications N/A

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Surveillance, Epidemiology, and End Results (SEER) Summary Stage

Procedure & Method Information

Name of Procedure/Method Surveillance, Epidemiology, and End Results (SEER) Summary Stage

Abbreviation SSS

Purpose To classify, stage, and code cancer anatomical extent of malignant tumors (i.e., cancer).

Year of Establishment 1977

Type of Procedure/Method

Developer(s) National Cancer Institute (NCI), United States

Oral Condition Category

Background Information

Background Information

The Surveillance, Epidemiology, and End Results (SEER) Summary Stage was first introduced in 1977 by the U.S. National Cancer Institute (NCI) for classifying, staging, and coding the anatomical extent of malignant tumors. The SEER Summary Stage (SSS), also referred to as General Staging, California Staging, and SEER Staging, is considered the most basic method of categorizing how far cancer has spread from its point of origin (Young, Roffers, Ries, Fritz, Hurlbut, 2001).

Although the staging is called SEER Summary Stage, the NCI SEER Program does not require its submission. The NCI SEER Program derives Summary Staging from Extent of Disease (EOD) codes by means of a computer algorithm (NAACCR, 2001). The SSS is utilized by many central registries and is a required data field for facilities and central registries participating in the National Program of Cancer Registries (NPCR) of the Centers for Disease Control and Prevention (CDC).

Changes Over Time

Unlike the initial 1977 Summary Staging Guide (SSS1977), the SEER Summary Stage 2000 (SSS2000), for cases diagnosed on or after January 1, 2001, is intended to be more of a coding than a staging manual. It has more detailed instructions complete with drawings, and there are coding instructions for each anatomical site in the International Classification of Diseases for Oncology, 3rd edition (ICD-O-3). For example, sites such as the larynx that previously had a single guide have separate staging/coding schemes for each subsite of the larynx (e.g., glottis, supraglottis, subglottis, and overlapping lesion or not otherwise specified) (Young, Roffers, Ries, Fritz, Hurlbut, 2001).

The SSS2000 changes affect hospital registries in the United States, most U.S. central registries, the NPCR, and software vendors. Canadian registries do not collect or derive SEER Summary Stage.

Procedure Method

Procedure Method

When assigning SSS codes, it is recommended that the sequence of the examination begin in situ, distant, localized, regional, and then unknown if extension or metastasis, so three of the summary staging categories (i.e., in situ, distant, and localized) can be ruled out quickly (See Guidelines for Summary Staging). Each of the head and neck sites and subsites has various and specific guidelines for staging and/or coding, so the SEER Summary Staging Manual, 2000 should be consulted. Some general guidelines for the SEER Summary Staging are provided below.

SEER Summary Stage

Code	
0	In situ: Noninvasive; intraepithelial
1	Localized only
2	Regional by direct extension only
3	Regional lymph node(s) involved only
4	Regional by BOTH direct extension AND regional lymph node(s) involved
5	Regional, NOS (Not Otherwise Specified)
7	Distant site(s)/lymph node(s) involved
9	Unknown if extension or metastasis (unstaged, unknown, or unspecified)

Source: Young JL Jr, Roffers SD, Ries LAG, Fritz AG, Hurlbut AA (eds). SEER Summary Staging Manual - 2000: Codes and Coding Instructions, NIH Pub. No. 01-4969, National Cancer Institute, Bethesda, MD, 2001. Retrieved September 6, 2001, from the World Wide Web: http://seer.cancer.gov/Publications/SummaryStage.

Guidelines for Summary Staging

In situ

1. Rule out in situ stage disease. Carcinomas and melanomas are the only types of cancer that can be classified as in situ. Only carcinomas have a basement membrane. Sarcomas are never described as in situ. A pathologist must examine the primary organ and state that the tumor is in situ. If the cancer is anything except a carcinoma or melanoma, it cannot be in situ.
2. If there is any evidence of invasion (or extension to), nodal involvement, or metastatic spread, the case is not in situ even if the pathology report so states. This is a common error in staging cervical cancer where the pathology report states that the cancer is "in situ with microinvasion" such a case would be staged as localized.

Distant

3. Rule out distant disease. If metastases can be documented, there is no need to spend a great deal of time

identifying local or regional spread. If distant metastases are recorded on x-ray or needle biopsy, the stage is already determined and the patient does not need to undergo a lot of other tests.

4. Hematopoietic diseases, such as leukemia and multiple myeloma, are considered disseminated or distant at time of diagnosis.

5. Rule out distant spread by reading the operative report for comments about seeding, implants, liver nodules, or other indications of metastases. Read diagnostic reports for references to distant disease.

6. If nodes, organs, or adjacent tissues are not specifically mentioned in the description of the various categories, attempt to cross-reference the term you have with those outlined. If there is no match, assume the site in question represents distant disease.

Localized

7. Rule out that the cancer is "confined to the organ of origin." In order for a lesion to be classified as localized, it must not extend beyond the outer limits of the organ and there must be no evidence of metastases anywhere else.

8. Terms such as "blood vessel invasion" or "perineural lymphatic invasion" do not necessarily indicate that the cancer has spread beyond the primary organ. If tumor at the primary site has invaded lymph or blood vessels, there is the potential for malignant cells to be transported throughout the body. Step 1 (invasion), has occurred, but not necessarily steps 2 (transport of cancer cells) and 3 (growth at the secondary site). The case may still be localized.

9. Vascular invasion within the primary is not a determining factor in changing the stage unless there is definite evidence of tumor at distant sites.

Regional

10. If in situ, local, and distant categories have been ruled out, the stage is regional.

11. For carcinomas, if there are lymph nodes involved with the tumor, the stage is at least regional.

12. For tissues, structures, and lymph nodes, assume ipsilateral unless stated to be contralateral or bilateral.

Unknown if Extension or Metastasis

13. If there is not enough information in the record to categorize a case, it must be recorded as unstageable.

Source: Young JL Jr, Roffers SD, Ries LAG, Fritz AG, Hurlbut AA (eds). SEER Summary Staging Manual - 2000: Codes and Coding Instructions, NIH Pub. No. 01-4969, National Cancer Institute, Bethesda, MD, 2001. Retrieved September 6, 2001, from the World Wide Web: http://seer.cancer.gov/Publications/SummaryStage.

General Guidelines

1. For each site, summary stage is based on a combined clinical and operative/pathological assessment. Gross
observations at surgery are particularly important when all malignant tissue is not removed. In the event of a
discrepancy between pathology and operative reports concerning excised tissue, priority is given to the
pathology report.

2. Summary stage should include all information available through completion of surgery(ies) in the first course of
treatment or within four months of diagnosis in the absence of disease progression, whichever is longer.

3. Summary stage information obtained after treatment with radiotherapy, chemotherapy, hormonal therapy, or
immunotherapy has begun may be included unless it is beyond the time frame given in guideline 2 above.

4. Exclude any metastasis known to have developed after the diagnosis was established.

5. Clinical information, such as description of skin involvement for breast cancer and distant lymph nodes for any
site, can change the stage. Be sure to review the clinical information carefully to assure accurate summary stage.
If the operative/pathology information disproves the clinical information, code the operative/pathology
information.

6. All schemes apply to all histologies unless otherwise noted. Exceptions to this, for example, include all
lymphomas and Kaposi sarcoma, which should be staged using the histology schemes regardless of the
primary site.

7. Autopsy reports are used in coding summary stage just as are pathology reports, applying the same rules for
inclusion and exclusion.

8. Death Certificate Only cases and unknown primaries are coded "9" for summary stage.

9. The summary stage may be described only in terms of T (tumor), N (node), and M (metastasis) characteristics. In
such cases, record the summary stage code that corresponds to the TNM information. If there is a discrepancy
between documentation in the medical record and the physician's assignment of TNM, the documentation takes

precedence. Cases of this type should be discussed with the physician who assigned the TNM.

10. Site-specific guidelines take precedence over general guidelines. Always consider the information pertaining to a specific site.

Source: Young JL Jr, Roffers SD, Ries LAG, Fritz AG, Hurlbut AA (eds). SEER Summary Staging Manual - 2000: Codes and Coding Instructions, NIH Pub. No. 01-4969, National Cancer Institute, Bethesda, MD, 2001. Retrieved September 6, 2001, from the World Wide Web: http://seer.cancer.gov/Publications/SummaryStage.

Established Modifications None

Federal Survey Modifications None

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Validaty

Reliability

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Thylstrup and Fejerskov Index

Procedure & Method Information

Name of Procedure/Method Thylstrup and Fejerskov Index

Abbreviation TF

Purpose To assess the prevalence and severity of fluorosis from a histological change perspective.

Year of Establishment 1978

Type of Procedure/Method

Developer(s) A. Thylstrup and O. Fejerskov

Oral Condition Category

Background Information

Background Information

Named for its developers, the Thylstrup and Fejerskov Index (TF) was developed in 1978 to assess the prevalence and severity of dental fluorosis. The purpose of its development was to refine, modify, and extend the original concepts established by H.T. Dean by creating a more sensitive or biological classification system for recording enamel changes found in areas where the fluoride in the drinking water was above the levels studied by H.T. Dean (Burt and Eklund, 1999; Rozier, 1994).

In addition, the TF Index is thought to be the most sensitive of the existing flurosis indices since its use calls for drying of the teeth which accentuates the appearance of fluorosis, making the diagnosis easier in questionable cases (Fraysse and Pouezat, 1994; Rozier, 1994).

Changes Over Time

In 1988, the Thylstrup and Fejerskov Index was modified by O. Fejerskov. It was recommended that only one surface (i.e., labial or buccal) per tooth be examined since fluorosis affects all tooth surfaces equally (Burt and Eklund, 1999), and because of the difficulty of getting an accurate assessment of fluorosis on occlusal surfaces due to the likelihood that scores would be affected by occlusal wear (Rozier, 1994).

As in the case of the original index, all teeth should be cleaned and dried with either cotton wool or gauze. The modified criteria are as follows:

Thylstrup and Fejerskov Index - Modified Clinical Criteria and Scoring (Fejerskov et al., 1988)

TF Score 0
The normal translucency of the glossy creamy white enamel remains after wiping and drying of the surface.

TF Score 1
Thin white opaque lines are seen running across the tooth surface. Such lines are found on all parts of the surface. The lines correspond to the position of the perikymata. In some cases, a slight "snow-capping" of cusps/incisal edges may also be seen.

TF Score 2
The opaque white lines are more pronounced and frequently merge to form small cloudy areas scattered over the whole surface. "Snow-capping" of incisal edges and cusp tips is common.

TF Score 3
Merging of the white lines occurs, and cloudy areas of opacity occur spread over many parts of the surface. In between the cloudy areas white lines can also be seen.

TF Score 4
The entire surface exhibits a marked opacity, or appears chalky white. Parts of the surface exposed to attrition or wear may appear to be less affected.

TF Score 5
The entire surface is opaque, and there are round pits (focal loss of the outermost enamel) that are less than 2 mm in diameter.

TF Score 6
The small pits may frequently be seen merging in the opaque enamel to form bands that are less than 2 mm in vertical height. In this class are included also surfaces where the cuspal rim of facial enamel has been chipped off, and the vertical dimension of the resulting damage is less than 2 mm.

TF Score 7
There is a loss of the outermost enamel in irregular areas, and less than half the surface is so involved. The remaining intact enamel is opaque.

TF Score 8
The loss of the outermost enamel involves more than half the enamel. The remaining intact enamel is opaque.

TF Score 9
The loss of the major part of the outer enamel results in a change of the anatomical shape of the surface/tooth. A cervical rim of opaque enamel is often noted.

Source: Fejerskov O, Manji F, Baelum V, Moller IJ. Dental fluorosis: a handbook for health workers. Copenhagen: Munksgaard, 1988.

Procedure Method

Procedure Method

To obtain the TF Index, the teeth first should be cleaned and dried with cotton wool rolls before the examination. For each tooth, the labial (buccal), lingual, and occlusal surfaces are examined and assigned a score as noted below.

Thylstrup and Fejerskov Index - Original Criteria and Scoring (Thylstrup and Fejerskov, 1978)

(Score = 0)
Normal translucency of enamel remains after prolonged air-drying.

(Score = 1)
Narrow white lines located corresponding to the perikymata.

(Score = 2)
Smooth surfaces: More pronounced lines of opacity which follow the perikymata. Occasionally confluence of adjacent lines.
Occlusal surfaces: Scattered areas of opacity < 2 mm in diameter and pronounced opacity of cuspal ridges.

(Score = 3)
Smooth surfaces: Merging and irregular cloudy areas of opacity. Accentuated drawing of perikymata often visible between opacities.
Occlusal surfaces: Confluent areas of marked opacity. Worn areas appear almost normal but usually circumscribed by a rim of opaque enamel.

(Score = 4)
Smooth surfaces: The entire surface exhibits marked opacity or appears chalky white. Parts of surface exposed to attrition appear less affected.
Occlusal surfaces: Entire surface exhibits marked opacity. Attrition is often pronounced shortly after eruption.

(Score = 5)
Smooth and occlusal surfaces: Entire surface displays marked opacity with focal loss of outermost enamel (pits) < 2 mm in diameter.

(Score = 6)
Smooth surfaces: Pits are regularly arranged in horizontal bands < 2 mm in vertical extension.
Occlusal surfaces: Confluent areas < 3 mm in diameter exhibit loss of enamel. Marked attrition.

(Score = 7)
Smooth surfaces: Loss of outermost enamel in irregular areas involving < 1/2 of entire surface.
Occlusal surfaces: Changes in the morphology caused by merging pits and marked attrition.

(Score = 8)
Smooth and occlusal surfaces: Loss of outermost enamel involving > 1/2 of surface.

(Score = 9)
Smooth and occlusal surfaces: Loss of main part of enamel with change in anatomic appearance of surface. Cervical rim of almost unaffected enamel is often noted.

Source: Thylstrup A, Fejerskov O. Clinical appearance of dental fluorosis in permanent teeth in relation to histologic changes. Community Dent Oral Epidemiol. 1978 Nov;6(6):315-28.

The Thylstrup and Fejerskov Index is expressed by distributions rather than mean scores and can be used to provide the prevalence or severity of dental fluorosis on selected teeth or the entire mouth.

Established Modifications No established modifications to the Thylstrup and Fejerskov Index since 1988.

Federal Survey Modifications None

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Tissue Health Index

Procedure & Method Information

Name of Procedure/Method Tissue Health Index

Abbreviation T-Health Index

Purpose To assess dental health status rather than dental disease in relation to caries.

Year of Establishment 1987

Type of Procedure/Method

Developer(s) A. Sheiham, J. Maizels, and A. Maizels

Oral Condition Category

Background Information

Background Information

The Tissue Health (T-Health) Index was the second composite indicator index developed by A. Sheiham, J. Maizels, and A. Maizels in 1987 to measure dental health status rather than dental disease.

The T-Health Index is the tissue health measure or the number of sound-equivalent teeth that represents the total amount of sound tooth tissue at a given point in time. It is defined as the weighted average of decayed teeth, filled (otherwise sound) teeth, and sound teeth. In principle, the weights represent the relative amount of sound tissue surrounding these three categories of teeth. In other words, a sound tooth contains more sound tissue, on average, than a filled tooth, while a filled tooth contains more sound tissue than a decayed tooth (Sheiham, Maizels, and Maizels, 1987). On this basis, missing teeth are considered as having zero sound tissue.

As in the case of the FS-T Index, very little research can be found documenting the usage of this index, even though some believe that it probably deserves more attention than it has received since it is a true approach to measuring dental health and function status rather than disease (Burt and Eklund, 1999). In addition, the T-Health Index has been determined to be a more reliable indicator of dental health status than the conventional DMFT Index and more efficient at revealing preliminary and behavioral factors that are associated with dental health status (Benigeri, Payette, and Brodeur, 1998; Sheiham, Maizels, and Maizels, 1987).

For example, the categories of decayed, filled, and missing teeth are each assigned equal weights to derive the DMF score. Therefore, the transformation of a decayed tooth into a filled tooth by restoration has no effect on the DMF value (Sheiham, Maizels, and Maizels, 1987). In addition, the DMF value, specifically the number of filled teeth, distorts the disease experience score of those who have regular dental check-ups and who observe a preventive approach to their dental health (Sheiham, Maizels, and Maizels, 1987).

Changes Over Time None

Procedure Method

Procedure Method

The T-Health Index is obtained by the formula:

T-Health Index = 1/4 (1*Decayed + 2*Filled + 4*Sound)

Note: It is unlikely that substantially different results would be obtained by varying the weights, provided that the ordinal relationship is maintained (Sheiham, Maizels, and Maizels, 1987).

Established Modifications

The THI, for Tissue Health Index, is the modified version of the T-Health Index. The THI was used on data from the 1980 Iowa Survey of Oral Health and on aggregate data published from three national surveys (i.e., the Decayed, Missing, and Filled Teeth in Adults, United States, 1960-1962, the Basic Data on Dental Examination Findings of Persons 1-74 years, United States, 1971-1974, and the Oral Health of United States Adults, 1985) (Jakobsen and Hunt, 1989). As a result, the THI was determined to be as easy to measure and calculate as the DMFT, and appeared to be a more sensitive indicator of dental health status (Jakobsen and Hunt, 1989).

The THI is the T-Health Index divided by 28 to make its range of scores from 0 to 1. The formula is:

THI = 1/4 (1*Decayed + 2*Filled + 4*Sound)/28

Federal Survey Modifications

None

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TMJ Scale

Procedure & Method Information

Name of Procedure/Method TMJ Scale

Abbreviation TMJ Scale

Purpose To screen and assess the physical and psychosocial dimensions of temporomandibular disorders.

Year of Establishment 1987

Type of Procedure/Method

Developer(s) S.R. Levitt, T.F. Lundeen, and M.W. McKinney

Oral Condition Category

Background Information

Background Information

In 1987, the TMJ Scale was introduced by S.R. Levitt, T.F. Lundeen, and M.W. McKinney to screen and assess the multidimensional (i.e., physical and psychosocial) aspects of temporomandibular disorders (TMD).

It is a 97-item self-report inventory that utilizes a 5-point Likert scale to evaluate symptoms in three domains: physical, psychosocial, and global. The physical domain consist of six scale dimensions. They are the pain report (PR), palpation pain (PP), perceived malocclusion (MO), joint dysfunction (JD), range of motion limitation (RL), and non-TMD (NT). The psychosocial domain has three scales, psychological factors (PF), stress (ST), and chronicity (CN), and the global domain is made up of one, the global scale (GS). It is the global scale score that indicates the probability of whether the subject has a TMD (Levitt, McKinney, and Lundeen, 1988).

The TMJ Scale takes approximately 10 to 15 minutes to complete and is administered to subjects aged 13 years and older. It can be administered to subjects with or without a TMD and in a clinical or research setting. It has been used in a variety of clinical settings including three university studies.

The TMJ Scale is a very valid and reliable multidimensional screening and assessment tool for evaluating subjects diagnosed with or without a TMD and for clinical or research use. Specifically, it has demonstrated a high degree of convergent and predictive validity and very acceptable levels of reliability and/or internal consistency (Levitt, McKinney, and Lundeen, 1988). According to research, the TMJ Scale can detect the presence of a TMJ dysfunction with a high degree of accuracy, usually in the range of 80 to 90 percent (Levitt and Lundeen, 1987). It has officially been accepted by the American Dental Association as an aid for diagnosing TMDs (Gaudet and Brown, 2000).

Changes Over Time None

Procedure Method

Procedure Method

The TMJ Scale is a self-report inventory, so the questionnaire is filled out by the respondent and submitted to the doctor afterwards. However, if the respondent is unable to fill out the questionnaire on his/her own, he/she may obtain assistance from a family member or health care professional. All questions should be answered, and even if the respondent is unsure how to answer, no question is skipped. The TMJ Scale has a user's manual, provided by the Pain Resource Center, Inc. located in Durham, North Carolina, that should be consulted.

TMJ Scale

1. This question should only be answered if you have upper and lower front teeth or are wearing a replacement for
   them. Open your mouth as wide as possible and position your hand as shown in the diagram (diagram not shown
   here). Place as many fingers as possible between your upper and lower front teeth. Now mark one number below
   indicating the number of fingers.

   Less than 1 finger ………………………………………………………… 0
   at least 1 finger …………………………………………………………… 1
   at least 2 fingers ………………………………………………………….. 2
   at least 3 fingers ………………………………………………………….. 3
   at least 4 fingers ………………………………………………………….. 4

   For questions #2 - 8 below, locate each area on your face (except F) using the lettered diagram (diagram not
   shown here). Press each area firmly on both sides of your face. Mark the number that indicates the maximum
   amount of pain you feel.

2. Pressing my temples (A on diagram)………………………………………………… 0 1 2 3 4
3. Pressing my jaw joints (B on diagram)……………………………………………… 0 1 2 3 4
4. Pressing my jaw muscles (C on diagram)…………………………………………… 0 1 2 3 4
5. Pressing the muscles under the sides of my jaw (D on diagram)…………………. 0 1 2 3 4
6. Pressing in my ears (E on diagram)………………………………………………… 0 1 2 3 4
7. Pressing the back of my neck (G on diagram)……………………………………. 0 1 2 3 4
8. Pressing the sides of my neck (H on diagram)……………………………………. 0 1 2 3 4

   Indicate the number which best describes how much of the time each statement below

applies to you, using the
following key:

none of the time	0
a little of the time	1
a moderate amount of the time	2
quite a bit of the time	3
all of the time	4

9. Just a light touch on my face causes shock-like pain.
10. My jaw must click or pop before I can open it wide.
11. My jaw opens all the way without any sideways movements.
12. My jaw looks open.
13. I have headaches which begin after seeing flashes of light or dark spots.
14. My jaw moves easily.
15. I have health problems which haven't responded to treatment.
16. I have pain in my jaw joint(s) (B on diagram).
17. My jaw tires easily when chewing.
18. I have headaches which are made worse by bright light.

19. It hurts my teeth when I bite.
20. I have muscle or joint pain in areas other than my head or neck.
21. I can move my jaw more to one side than to the other.
22. I feel tense and worried.
23. I have drainage from my ear(s).
24. I feel sad and depressed.
25. I clench my teeth.
26. My bite feels comfortable.
27. I have jaw pain which gets worse the more I move my jaw.
28. It is difficult to find a comfortable position for my jaw.

29. I have pain in my ear(s) (E on diagram).
30. I have sinus problems.
31. When I bite down normally, my front teeth touch.
32. During my life, I've had many different painful disorders.
33. I have facial pain which comes on suddenly like electric shocks.
34. I can open my mouth as far as possible without pain.
35. I have pain in or behind my eye(s).
36. My jaw makes a grating or grinding noise when it opens and closes.
37. I think my bite is off.
38. I have pain which gets worse with stress or tension.

39. My jaw clicks or pops when I chew.
40. I can bite down hard without pain in my jaw.
41. One painful problem is followed by another.
42. I have jaw pain which makes me feel sick and feverish.
43. I grind my teeth during the day.
44. I have numb areas on my face.
45. I use nerve pills, sleeping pills, or alcohol for relief.

46. I can move my jaw smoothly.
47. I can chew without bumping my teeth unexpectedly.
48. I have a feeling of pins and needles on my face.

49. I have pain in my jaw muscles (C on diagram).
50. I have pain in the back of my neck. (G on diagram).
51. Over the years, I've been under a lot of stress.
52. My jaw twitches or jerks uncontrollably.
53. When I bite down normally, my back teeth touch.
54. The way my front teeth fit seems to be changing.
55. A light touch on one side of my face causes shock-like pain on the other.
56. I have ringing in my ear(s).
57. I have pain which gets worse with certain people or situations.
58. I have pain in the side(s) of my neck (H on diagram).

59. I have a steady pain across my forehead.
60. I have may changing pains.
61. I feel angry.
62. Other people notice noise from my jaw when I chew.
63. I can chew food as well as I used to.
64. I have health problems which seem to be getting worse.
65. I have pain in the muscles under my jaw (D on diagram).
66. I have pain in my temple(s) (A on diagram).
67. I feel anxious.
68. I can open my mouth as wide as I used to.

69. The way my back teeth fit seems to be changing.
70. I sleep well.
71. I have head or facial pain which gets worse when I bend over.
72. When I touch one side of my face, the other side gets numb.
73. My jaw gets stuck and won't open all the way.
74. The only real problems in my life are problems with physical health.
75. I've had conflicting doctors' opinions about health problems.
76. I can move my jaw in any direction without pain.
77. I have facial pain which gets worse in cold weather.
78. I feel frustrated.

79. I have a stuffy nose.
80. Recently I've been under a lot of stress.
81. I have headaches which make me feel sick to my stomach.
82. I can take big bites of things like apples.
83. I have work or family pressures.
84. I have pain and stiffness in my finger joints.
85. My back teeth feel like they fit properly.
86. I believe I have an incurable problem in spite of reassurance by doctors.
87. In the morning my teeth are sore and my jaw is tired.
88. My ears feel blocked or stopped up.

89. I have many health problems.

90. My jaw moves just as far forward as it used to.
91. I have difficulty swallowing.
92. I have pain behind my ear(s) (F on diagram).
93. I have facial pain when other joints are also sore.
94. I have nervous problems.
95. I have throbbing headaches.
96. I feel dizzy.
97. I consider myself to be a sickly person.

S.R. Levitt, MD, PhD, T.F. Lundeen, DMD, and M.W. McKinney PhD

Source: Steven R. Kilpatrick, DDS. Zhub Instant Webstores. Retrieved July 16, 2001, from the World Wide Web: http://www.zhub.com/kilpatrick/listings/9.html.

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None

Federal Survey Modifications

None

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TNM Classification System - Head and Neck Sites

Procedure & Method Information

Name of Procedure/Method TNM Classification System - Head and Neck Sites *Abbreviation* TNM

Purpose To classify and stage the anatomical extent of malignant tumors (i.e., cancer).

Year of Establishment 1959 *Type of Procedure/Method*

Developer(s) American Joint Committee on Cancer (AJCC) *Oral Condition Category*

Background Information

Background Information

The TNM classification system was originally developed by Pierre Denoix between 1943 and 1952. Later, the Union Internationale Contre le Cancer (UICC) (i.e., International Union Against Cancer) adopted the TNM system in 1954, and Pierre Denoix served as President of the UICC from 1973 to 1978. By 1967, the UICC had published nine brochures that described the TNM classification of cancers at 23 body sites (UICC, 2001).

The American Joint Committee for Cancer Staging and End-Results Reporting (AJC), later named the American Joint Committee on Cancer (AJCC) in June of 1980, adopted the TNM system in 1959 and published its first official edition of the Manual for Staging of Cancer in 1977 as a reference guide for the TNM classification system. Although the TNM system was adopted by the AJCC, it was not identical to the UICC's TNM system.

In 1982, under the leadership of AJCC Chairman, Dr. Harvey Baker, discussions were first undertaken with the UICC TNM Committee to formulate a uniform TNM classification so that one system of staging might be used worldwide (AJCC, 1997; UICC, 2001). This universal TNM system was first published in the third edition of the AJCC Cancer Staging Manual and the fourth edition of the TNM Classification of Malignant Tumors, published in 1987 and revised in 1992, for the UICC. Even though the AJCC and UICC have maintained separate publications, the TNM classification system (i.e., definitions and stage grouping of cancer for all anatomical sites) still remains consistent between the two organizations today.

The TNM system classifies the anatomical extent of malignant tumors in terms of the primary tumor (T), involvement of the regional lymph nodes (N), and distant metastasis (M); and then groups the findings of these three elements (i.e., T, N, M) into stages (i.e., Stages 0, I, II, III, and IV). The TNM classification system is based on the premise that cancers of the same anatomical site and histology share similar patterns of growth and extension (AJCC, 1997). However, in instances such as thyroid carcinoma, age is also a significant factor that is considered in the staging recommendations since it influences the prognosis.

Depending on when the diagnosis of cancer occurs, the TNM system has four classification schemes that are denoted by a prefix (i.e., c, p, r, and a). The clinical classification (cTNM or TNM) signifies the initial diagnosis of cancer obtained before the first treatment and its staging is used as a guide for selecting primary therapeutic treatment. The pathologic classification (pTNM) represents the additional evidence of cancer obtained via surgery and histological examination of surgically removed tissue prior to the first treatment. The pTNM does not replace the cTNM and should be retained along with the cTNM in the patient's medical record. Retreatment (rTNM) is the classification format use for recurrent cancer after a disease-free interval, and autopsy (aTNM) symbolizes the diagnostic evidence of cancer obtained after the death of a person by postmortem examination. The staging for both the pTNM and the rTNM is used as a guide for adjuvant therapy, estimating prognosis, and reporting end results (AJCC, 1997).

In regard to head and neck cancers, the TNM system has staging classifications for six major head and neck sites: the lips and oral cavity; the pharynx including the base of the tongue, soft palate, and uvula; the larynx; the paranasal sinuses; the major salivary glands (i.e., parotid, submandibular, and sublingual); and the thyroid gland.

Changes Over Time

The TNM classification system has been uniform and consistent between the AJCC and the UICC since 1982. In 1992, the site codes (e.g., C00.0 - external upper lip, C00.1 - external lower lip) were revised in accordance with the International Classification of Diseases for Oncology (ICD-O), Second Edition (1990).

In general, as knowledge increases about etiology and various diagnostic and treatment methods, the TNM classification and staging system of cancer will continue to evolve. Specifically, in regard to head and neck cancer, the staging of cancers was revised in the fifth edition of the AJCC Cancer Staging Manual. There were some minor changes in the T classifications and a major revision of the nasopharynx classification.

Procedure Method

Procedure Method

First, the desired anatomical site is thoroughly examined. In the AJCC Cancer Staging Manual, fifth edition, each of the six major head and neck sites has various and specific examination guidelines, T and N definitions, and staging groupings outlined that should be consulted. There is also a cancer staging data form for recording the T, N, and M; the stage of the cancer; and the histological type and grade in some instances. The cancer staging data form is an additional document maintained within the patient's medical record and is not considered a substitute for history, treatment, or follow-up records (AJCC, 1997). If cancer is staged during several time periods, a separate form is used each time or the stage for each time period is clearly defined if all are recorded on a single form.

In general, while conducting the examination, the T, N, and M are assigned codes based on the following criteria. Afterwards, these three codes may be combined, so a stage of cancer (i.e., Stage 0, I, II, III, and IV) can be assigned. For each of six major head and neck sites, there is a stage grouping chart that lists the different code combinations of T, N, and M that should be referred to before assigning a stage of cancer. The stages are Stage 0, I, II, III, and IV. Stage 0 is carcinoma in situ, Stage IV indicates distant metastasis, while Stages I through III denote a relatively greater anatomical extent of cancer between Stages 0 and IV.

TNM Classification System

Primary Tumor (T):

TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
Tis	Carcinoma in situ
T1, T2, T3, T4	Increasing size and/or local extent of the primary tumor

Regional Lymph Nodes (N):

NX	Regional lymph nodes cannot be assessed
N0	No regional lymph node metastasis
N1, N2, N3	Increasing involvement of regional lymph nodes

Note: Direct extension of the primary tumor into a lymph node(s) is classified as a lymph node metastasis. Metastasis in any lymph node other than regional is classified as a distant metastasis. A microscopically confirmed tumor nodule, up to 3 mm in greatest extent, is classified in the T category, as discontinuous extension of the primary tumor. If the tumor nodule is greater than 3 mm, without evidence of residual lymph node tissue, it is classified as a regional lymph node metastasis.

Distant Metastasis (M):

MX	Distant metastasis cannot be assessed
M0	No distant metastasis
M1	Distant metastasis

Source: American Joint Committee on Cancer, American Cancer Society, American College of Surgeons. AJCC cancer staging manual, 5th edition. Philadelphia: Lippincott-Raven, 1997.

As an example, for the lip and oral cavity site, the definitions and stage grouping recommendations for the TNM classification system are:

Primary Tumor (T):

TX	Primary tumor cannot be assessed
T0	No evidence of primary tumor
Tis	Carcinoma in situ
T1	Tumor 2 cm or less in greatest dimension
T2	Tumor more than 2 cm but not more than 4 cm in greatest dimension
T3	Tumor more than 4 cm in greatest dimension
T4 (lip)	Tumor invades adjacent structures (e.g., through cortical bone, inferior alveolar nerve, floor of mouth, skin of face)
T4 (oral cavity)	Tumor invades adjacent structures (e.g., through cortical bone, into deep [extrinsic] muscle of

tongue, maxillary sinus, skin. Superficial erosion alone of bone/tooth socket by gingival primary
is not sufficient to classify as T4.)

Regional Lymph Nodes (N):

NX Regional lymph nodes cannot be assessed
N0 No regional lymph node metastasis
N1 Metastasis in a single ipsilateral lymph node, 3 cm or less in greatest dimension
N2 Metastasis in a single ipsilateral lymph node, more than 3 cm but not more than 6 cm in greatest
dimension; or in multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension;
or in bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension
N2a Metastasis in single ipsilateral lymph node more than 3 cm but not more than 6
cm in greatest dimension
N2b Metastasis in multiple ipsilateral lymph nodes, none more than 6 cm in greatest
dimension
N2c Metastasis in bilateral or contralateral lymph nodes, none more than 6 cm in
greatest dimension
N3 Metastasis in a lymph node more than 6 cm in greatest dimension

Distant Metastasis (M):

MX Distant metastasis cannot be assessed
M0 No distant metastasis
M1 Distant metastasis

Staging Grouping

Stage 0
Tis N0 M0
Stage I
T1 N0 M0
Stage II
T2 N0 M0
Stage III
T3 N0 M0
T1 N1 M0
T2 N1 M0
T3 N1 M0
Stage IVA
T4 N0 M0
T4 N1 M0

Any T N2 M0
Stage IVB
Any T N3 M0
Stage IVC
Any T Any N M1

Source: American Joint Committee on Cancer, American Cancer Society, American College of Surgeons. AJCC cancer staging manual, 5th edition. Philadelphia: Lippincott-Raven, 1997.

So, if the T, N, and M for the external upper lip were recorded as T2, N1, and M0, respectively, the stage would be classified as Stage III according to the above staging grouping recommendations.

Other general rules applicable to all sites are:

1. All cases should be confirmed microscopically for TNM classification (including clinical classification).

2. If there is doubt concerning the correct T, N, or M classification to which a particular case should be allotted,
then the lower (less advanced) category is chosen. This also applies to the stage grouping.

3. In the case of multiple, simultaneous tumors in one organ, the tumor with the highest T category is the one
selected for classification and staging, and the multiplicity or the number of tumors is indicated in parentheses:
for example, T2(m), or T2 (5). In the circumstance of simultaneous bilateral cancers in paired organs, each
tumor is classified separately as an independent tumor in different organs. In the case of tumors of the thyroid,
liver, and ovary, multiplicity is a criterion of T classification.

In those cases in which classification is performed during or following initial multimodality therapy, for example,
neoadjuvant therapy, which might alter the original pathology, the TNM or pTNM categories are identified by a
y prefix: ypTNM

4. Definitions of TNM categories and stage grouping may be telescoped (expanded as subsets of existing
classifications) for research purposes as long as the original definitions are not changed. For instances, any of the
published T, N, or M classifications can be divided into subgroups for testing, and if validated may be submitted to
the AJCC to be evaluated for inclusion into the classification system.

5. In the case of a primary of unknown origin, staging will be based on reasonable clinical certainty of the primary
origin.

	Sources: American Joint Committee on Cancer, American Cancer Society, American College of Surgeons. AJCC cancer staging manual, 5th edition. Philadelphia: Lippincott-Raven, 1997; American Joint Committee on Cancer (AJCC). Retrieved August 16, 2001, from the World Wide Web: http://www.cancerstaging.org/manual.html.
Established Modifications	None
Federal Survey Modifications	None

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Tooth Surface Index of Fluorosis

Procedure & Method Information

Name of Procedure/Method Tooth Surface Index of Fluorosis

Abbreviation TSIF

Purpose To assess the prevalence and severity of fluorosis from a tooth surface basis.

Year of Establishment 1984

Type of Procedure/Method

Developer(s) U.S. National Institute of Dental Research (NIDR)

Oral Condition Category

Background Information

Background Information

In 1984, the Tooth Surface Index of Fluorosis (TSIF) was developed and used by researchers (i.e., H.S. Horowitz, W.S. Driscoll, R.J. Meyers, et al.) at the National Institute of Dental Research. The intent of the TSIF was to assess the prevalence of fluorosis from a tooth surface perspective.

The TSIF is thought to be more sensitive than Dean's Fluorosis Index for the mildest forms of fluorosis (Burt and Eklund, 1999). In addition, TSIF accounts for each tooth surface in the mouth, whereas Dean's index is applied only to the two worst teeth in the mouth.

Changes Over Time

None

Procedure Method

Procedure Method

To obtain the TSIF, each fully erupted, unrestored tooth surface is examined and assigned a score on a 0 to 7 scale noted below. Two scores are assigned to the anterior teeth from the labial and lingual aspects, and three scores are assigned to the posterior teeth from the buccal, lingual, occlusal aspects. The tooth surfaces are not dried before the examination. The thought being that teeth should be assessed in their natural state, and that those opacities that are visible only after drying should not be included in the definition of fluorosis (Rozier, 1994).

If more than one category of fluorosis exists on a tooth surface, for example, discrete pitting and staining (Score = 6) and confluent pitting (Score = 7), the highest numerical score is assigned to that surface.

The TSIF is not an interval scale, so the scores are not averaged. However, the scores may be arrayed in various frequency distributions for surface scores or for a maximum mouth score, which can be compared by nonparametric tests (Horowitz, Driscoll, Meyers, et al., 1984). For the TSIF, there are a maximum of 72 scores per subject.

Clinical Criteria and Scoring System for the Tooth Surface Index of Fluorosis

(Score = 0)
Enamel shows no evidence of fluorosis.

(Score = 1)
Enamel shows definite evidence of fluorosis, namely areas with parchment-white color that total less than one-third of the visible enamel surface. This category includes fluorosis confined only to incisal edges of anterior teeth and cusp tips of posterior teeth ("snowcapping").

(Score = 2)
Parchment-white fluorosis totals at least one-third of the visible surface, but less than two-thirds.

(Score = 3)
Parchment-white fluorosis totals at least two-thirds of the visible surface.

(Score = 4)
Enamel shows staining in conjunction with any of the preceding levels of fluorosis. Staining is defined as an area of definite discoloration that may range from light to very dark brown.

(Score = 5)
Discrete pitting of the enamel exists, unaccompanied by evidence of staining of intact enamel. A pit is defined as a definite physical defect in the enamel surface with a rough floor that is surrounded by a wall of intact enamel. The pitted area is usually stained or differs in color from the surrounding enamel.

(Score = 6)
Both discrete pitting and staining of the intact enamel exist.

(Score = 7)
Confluent pitting of the enamel surface exists. Large areas of enamel may be missing and the anatomy of the tooth may be altered. Dark-brown stain is usually present.

Source: Burt BA, Eklund SA. Dentistry, Dental Practice, and the Community, 5th edition. Philadelphia: W.B. Saunders Company, 1999.

Established Modifications	None
Federal Survey Modifications	None

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Validaty

Reliability

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Tooth Wear Index

Procedure & Method Information

Name of Procedure/Method Tooth Wear Index

Abbreviation TWI

Purpose To assess the extent and severity of dental erosion, attrition, and abrasion.

Year of Establishment 1984

Type of Procedure/Method

Developer(s) B.G.N. Smith and J.K. Knight

Oral Condition Category

Background Information

Background Information

In 1984, the Tooth Wear Index (TWI) was introduced by B.G.N. Smith and J.K. Knight to assess the extent and severity of dental erosion, attrition, and abrasion as well as any combination of these conditions. Prior to the development of the Tooth Wear Index (TWI), a number of indices were used to record the extent of tooth tissue destruction from erosion, abrasion, and attrition; however, the etiology first had to be established before utilizing any of these indices. Also, most of these indices were used only if the corresponding condition (i.e., erosion, attrition, or abrasion) existed (Smith and Knight, 1984).

The TWI is designed for research use into the etiology, prevention, and management of tooth wear problems, and it can be implemented in epidemiological studies in addition to the long-term monitoring of tooth wear among individual patients (Smith and Knight, 1984).

The TWI is considered to be a reliable, efficient, and practical method for recording the degree of tooth wear without necessarily being able to diagnose its etiology or combined etiologies (Smith and Knight, 1984).

Changes Over Time

The TWI is still used as a dental assessment of tooth wear. However, in 1994, A. Millward, L. Shaw, A.J. Smith, J.W. Rippin, and E. Harrington modified and implemented a new scoring system to focus on tooth wear among pediatric patients.

Procedure Method

Procedure Method

The TWI is assessed by visual exam either clinically (i.e., directly from the mouth) or from photographs. Each tooth surface (i.e., the cervical surface, the buccal [labial] surface, the lingual surface, and the occlusal or incisal surface) is examined and evaluated for tooth wear and coded according to the criteria outlined below. For permanent dentition or 32 teeth, there is a possible total of 128 tooth surfaces per individual. Heavily restored surfaces and missing teeth are not recorded; however, they may be coded as "M" for missing and "R" for restored to facilitate data recording.

Tooth Wear Index (TWI) Surface Codes and Criteria (Smith and Knight, 1984)

Code	Surface	Criteria
0	B/L/O/I	No loss of enamel surface characteristics.
	C	No change of contour.
1	B/L/O/I	Loss of enamel surface characteristics.
	C	Minimal loss of contour.
2	B/L/O	Loss of enamel exposing dentine for less than one-third of the surface.
	I	Loss of enamel just exposing dentine.
	C	Defect less than 1 mm deep.
3	B/L/O	Loss of enamel exposing dentine for more than one-third of the surface.
	I	Loss of enamel and substantial loss of dentine, but not exposing pulp or secondary dentine.
	C	Defect 1 to 2 mm deep.
4	B/L/O	Complete loss of enamel, or pulp exposure, or exposure of secondary dentine.
	I	Pulp exposure or exposure of secondary dentine.
	C	Defect more than 2 mm deep, or pulp exposure, or exposure of secondary dentine.

Note: Surfaces are abbreviated as B (buccal), L (labial), O (occlusal), I (incisal), and C (cervical).

Source: Smith BGN, Knight JK. An index for measuring the wear of teeth. Br Dent J. 1984;156:435-8.

Established Modifications

In 1994, the TWI was modified by A. Millward, L. Shaw, A.J. Smith, J.W. Rippin, and E. Harrington to examine tooth wear in children and its relationship with acidic dietary constituents.

The procedure for the modified TWI begins with proper lighting. Afterward, the teeth are dried with compressed air, and the buccal, occlusal/incisal, and lingual surfaces are examined for tooth wear. Traumatized teeth or teeth with large restorations or extensive caries are excluded. The criteria for the modified TWI are as follows:

Modified Tooth Wear Index (Millward, Shaw, Smith, Rippin, and Harrington, 1994)

Code	Surfaces	Criteria
0	B, L, O, I	No loss of enamel surface characteristics.
1	B, L, O, I	Loss of enamel surface characteristics.
2	B, L, O	Loss of enamel, visible dentine on less than one-third of the surface.
	I	Loss of enamel with visible dentine.
3	B, L, O	Loss of enamel, visible dentine on more than a third of the surface area.
	I	Loss of enamel and substantial loss of dentine, but not exposing pulp or secondary

dentine.

4	B, L, O	Complete loss of enamel, pulp exposure, or exposure of secondary dentine.
	I	Pulp exposure or exposure of secondary dentine.

Note: B = buccal or labial; L = lingual or palatal; O = occlusal; I = incisal.

Source: Millward A, Shaw L, Smith AJ, Rippin JW, Harrington E. The distribution and severity of tooth wear and the relationship between erosion and dietary constituents in a group of children. Int J Paediatr Dent. 1994 Sep;4(3):151-7.

Federal Survey Modifications

In the National Health and Nutrition Examination Survey (NHANES) IV, 1998-2004, the oral health assessment includes a modified version of the Tooth Wear Index due to its reported levels of reproducibility and the feasibility of comparing results with other studies (NIDCR, 2001).

For all sampled persons in NHANES IV, the TWI visual examination evaluates and codes the buccal, lingual, and incisal surfaces on the four maxillary and mandibular incisors and the occlusal surface of the mandibular first molars using proper lighting and a plane surface mirror. Each tooth surface is dried prior to the examination. The criteria for the modified TWI in NHANES IV are outlined below.

Modified Tooth Wear Index (TWI) in NHANES IV (Al-Dlaigan, Shaw, and Smith, 2001)

Score	Surfaces	Criteria
1	B/L/I/O	No loss of enamel surface characteristics.
2	B/L/I/O	Loss of enamel surface characteristics.
3	B/L/O	Loss of enamel, visible dentine for less than 1/3 of the surface.
	I	Loss of enamel just exposing dentine.
4	B/L/O	Loss of enamel, visible dentine for greater than 1/3 of the surface.
	I	Loss of enamel and substantial loss of dentine but not exposure of pulp or secondary dentine.
5	B/L/O	Complete loss of enamel, or pulp exposure, or secondary dentine.
	I	Pulp exposure or exposure of secondary dentine.
9	B/L/I/O	Excluded from analysis (missing tooth, partially erupted, orthodontic bands, composite restoration, any crowns, tooth fracture, or sealant).

Note: B = Buccal; L = Lingual; O = Occlusal; I = Incisal.

Source: National Institute of Dental and Craniofacial Research. Proposal for the Oral Health Examination in the National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC, 2001.

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Validaty

Reliability

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Madlena M, Keszthelyi G, Alberth M, Nagy A. [The attrition of deciduous teeth]. Fogorv Sz. 1989 Sep;82(9):273-6. [Article in Hungarian]

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National Center for Health Statistics. National Health and Nutrition Examination Survey IV, 1998-2004. Washington, DC: U.S. Government Printing Office.

Treatment Priority Index

Procedure & Method Information

Name of Procedure/Method Treatment Priority Index

Abbreviation TPI

Purpose To assess the presence and severity of malocclusion and the need for orthodontic treatment.

Year of Establishment 1967

Type of Procedure/Method

Developer(s) R.M. Grainger

Oral Condition Category

Background Information

Background Information

In 1967, R.M. Grainger introduced the Treatment Priority Index (TPI), referred to as the Orthodontic Treatment Priority Index, to assess the severity of malocclusion, the degree of handicap, and primarily the need for orthodontic treatment. The TPI is a modification of the Malocclusion Severity Estimate (MSE) developed earlier by Grainger (Tang and Wei, 1993). It is based on ten weighted measuring components or occlusal traits associated with malocclusion and an eleventh weighted component for special cases of gross dentofacial anomalies. The components are (1) overjet, (2) reversed overjet or underjet, (3) overbite, (4) anterior open bite, (5) congenital absence of incisors, (6) disto-occlusion, (7) mesio-occlusion, (8) posterior crossbite with maxillary teeth buccal to the normal position, (9) posterior crossbite with maxillary teeth lingual to normal position, (10) displacement of individual teeth, and (11) cleft palate, traumatic conditions, and other gross anomalies.

By combining the previously mentioned ten occlusal traits into natural groupings, the TPI also defined seven malocclusion syndromes, with each having a corresponding equation determined by statistical method techniques that, when combined, produced a formula or equation for the TPI. The seven syndromes are (1) maxillary expansion syndrome (i.e., maxillary to buccal), (2) overbite, (3) retrognathism (i.e., overjet), (4) open bite, (5) prognathism (i.e., reversed overjet), (6) maxillary collapse syndrome (i.e., maxillary to lingual), and (7) congenitally missing incisor.

The TPI is considered to be a simple, valid, and reliable orthodontic index especially for epidemiologic study (Scivier, Menezes, and Parker, 1974; Lewis, Albino, Cunat, and Tedesco, 1982; Ghafari, Locke, and Bentley, 1989).

Changes Over Time None

Procedure Method

Procedure Method

The assessment procedure for the TPI can be made directly from the mouth (i.e., clinically) or indirectly from dental study casts. For the TPI, the mouth or cast is examined and scored by a trained professional for each of the ten components of malocclusion: (1) overjet of the upper anterior segment, (2) reversed overjet of lower anterior segment, (3) overbite of the upper anterior over the lower anterior, (4) anterior open bite, (5) congenital absence of incisors, (6) disto-occlusion molar relation, (7) mesio-occlusion molar relation, (8) posterior crossbite with maxillary teeth buccal to the normal position, (9) posterior crossbite with maxillary teeth lingual to normal position, and (10) displacement of individual teeth. Measurements are assessed with a steel millimeter ruler. Conventionally, the TPI is used on permanent dentition and is thought to be inadequate for assessing the occlusion of deciduous or mixed dentition (Tang and Wei, 1993).

Overjet and Reversed Overjet

Overjet in the upper anterior segment is the horizontal distance between the labial surface of the lower central incisor and the labial surface of the most prominent upper central incisor while in centric occlusion. Reversed overjet in the lower anterior segment is the horizontal distance between the labial surface of the upper central incisor and the labial surface of the most prominent lower central incisor.

Overbite and Open Bite

Both are measurements of the incisors in the vertical plane. For overbite of the upper anterior over the lower anterior, the palatal surface of the upper central incisor is divided into thirds. That third of the palatal surface with which the lower central incisor occludes while the teeth are in centric occlusion is the overbite measurement. A measurement is also recorded for the lower central incisors which occlude with the palatal mucosa. Open bite is the greatest distance between the incisal surface of the upper central incisors and the incisal surface of the lower central incisors while in centric occlusion.

Congenitally Absent Incisors

This procedure is a self-explanatory and subjective assessment even though developmentally missing teeth cannot be determined for sure without radiographs.

Distal and Mesial Occlusion

The disto- and mesio-occlusion molar relationships record the position of the upper and lower first permanent molars or the deciduous second molars, if present, on either side of the mouth.

Buccal and Lingual Posterior Crossbites

This assessment is the number of maxillary teeth in the buccal segments that are either buccal or lingual according to the position of the upper teeth to the lower teeth.

Displacement of Individual Teeth

As outlined below in the chart, tooth displacements/rotations are scored for the number less than and about 2 mm from the lines of the dental arch or rotated less than 45 degrees and more than 2 mm from the lines of the dental arch or rotated more than 45 degrees, respectively, for each segment of the dental arch (i.e., the upper left, upper anterior, upper right, the lower left, lower anterior, and lower right).

Treatment Priority Index

1. Maxillary overjet in mm: 0 1 2 3 4 5 6 7 8 9 9+
2. Reversed overjet in mm: 0 1 2 3 4 5 6 7 8 9
3. Overbite: crown thirds: 0 1 2 3 4 5
4. Open bite in mm: 0 1 2 3 4 5
5. Congenitally missing incisors: 0 1 2 2+

Scored separately if opposite sides at variance:
6. Disto-occlusion: 0 1 2 3 4
7. Mesio-occlusion: 0 1 2 3 4

Number of maxillary teeth in posterior crossbite:
8. To buccal: 0 1 2 3 4 5 6 7
9. To lingual: 0 1 2 3 4 5 6 6+

10. Displaced or rotated teeth (minor displacements not counted)
(a) No. less than 2 mm or 45 degrees: U.L.- U.A.- U.R.- L.L.- L.A.- L.R.- Total
(b) No. more than 2 mm or 45 degrees: U.L.- U.A.- U.R.- L.L.- L.A.- L.R.- Total
(0 or 1 - no score)
(Maximum 10) Score:

Source: Scivier GA, Menezes DM, Parker CD. A pilot study to assess the validity of the Orthodontic Treatment Priority Index in English schoolchildren. Community Dent Oral Epidemiol 1974;2(5):246-52.

After each of the above components is measured/assessed and scored, the subscore weights are summed to compute the TPI. Total scores for the TPI range from 0 to 10 or more, with higher scores denoting more severe malocclusion.

Established Modifications

None

Federal Survey Modifications

For the National Health and Nutrition Examination Survey (NHANES) III, 1988-1994, the assessment for occlusal characteristics was based on the TPI developed by Grainger. For NHANES III, the TPI method scored six occlusal characteristics (i.e., incisor alignment, maxillary midline diastema, the presence or absence of crossbite, overjet, overbite, and open bite) separately, and a weighted regression formula was used to compute a single summary score that represented treatment need. An excerpt of the criteria and procedures for the six occlusal characteristics are provided below as outlined in NHANES III.

1. Incisor Alignment

Criteria: The scoring method involves measuring the linear displacement of anatomic contact points (as distinguished from the clinical contact points) of each maxillary and mandibular incisor from the adjacent tooth anatomic contact point. The sum of these five displacements represents the degree of irregularity in the alignment of incisors in each jaw. Perfect alignment from the mesial aspect of the left canine to the mesial aspect of the right canine would theoretically have a score of zero, with increased crowding represented by greater displacement and, therefore, a higher index score.

Procedure: Start at the mesial of the maxillary right canine and evaluate each contact around to the mesial of the left canine, then evaluate each contact of the mandibular arch starting at the mesial of the mandibular left canine and continuing to the mesial of the right canine. The millimeter distance from the contact point of each tooth to that of its neighbor is scored using the NIDR periodontal probe, which is held perpendicular to the curve of the arch. The numbers range from 0 to 9 and should be rounded down to the nearest whole millimeter. Contacts are scored only if both teeth have erupted to the level of the occlusal plane. A call of "Y" is made for contacts that cannot be scored, for example, missing teeth, unerupted or partially erupted teeth, and fractured teeth.

Note: In calculating the irregularity score, mesiodistal separation of contact points, as when a space (diastema) exists between teeth, is ignored. For example, if the central incisors are separated by 2 mm but are aligned so that there is no labiolingual discrepancy between the contact points, the score is zero. If they are separated by 2 mm but the contact points also are labiolingually displaced by 2 mm, the score is 2.

2. Maxillary Midline Diastema

Criteria: A space between the maxillary central incisors of greater than 2 mm width is scored as the presence of midline diastema.

Procedure: The call for maxillary midline diastema is "1" if the width, measured at the incisal edge, exceeds 2 mm. Otherwise, the call is zero for midline diastema. If any one of the incisors is missing, has a full crown, or has a fractured mesial incisal edge, then a "Y" call is made.

3. Presence or Absence of Crossbite

Criteria: Only the posterior primary or permanent teeth, defined as those distal to the canine, are scored if they have erupted into occlusal contact. Single tooth crossbites are ignored. The criterion for presence of crossbite is that at least two teeth are involved, i.e., either one tooth on each side or two teeth on one side. Only if the teeth are displaced facially or lingually past cusp to cusp, crossbite is scored. If any permanent tooth is showing, then, its predecessor, even if in crossbite, is ignored.

Procedure: Have the subject close together his/her posterior teeth normally and look for the presence or absence of crossbite as determined by the foregoing criteria, and give the appropriate call (i.e., "1" for presence and "0" for absence). A "Y" call is made if any two of the posterior teeth are missing or if one tooth is in crossbite and one is missing.

4. Overjet

Criteria: Overjet is defined as the horizontal overlap of the incisor teeth. It is measured to the lowest whole millimeter using the periodontal probe, from the midpoint of the labial surface of the most anterior lower central incisor to the midpoint of the labial surface of the most anterior upper central incisor, parallel to the occlusal plane. The overjet is positive if the upper incisor is ahead of the lower incisor, zero if the upper and lower incisors are immediately on top of each other, and negative if the lower incisor is in front of the upper incisor. If any one of the four central incisors is missing, fractured, or not fully erupted, then overjet should not be measured, and a "Y" call is made.

Procedure: Have the subject close together his/her posterior teeth normally and measure the overjet, up to the labial edge of the outer tooth, rounded to the lowest full millimeter, using the periodontal probe. If the upper central incisor is ahead of the lower, call out the number as a positive one. If the incisors are on top of each other (edge to edge), call out a zero score, and if the lower incisor is anterior to the upper incisor, call out a negative score. If the central incisors are not in similar anterior position, take an average judgment. For overjet, measurements range from "0" to "9+" and a "Y" call is made if the overjet cannot be measured due to missing, fractured, or unerupted teeth.

5. Overbite and 6. Openbite

Criteria: Clinically and quantitatively overbite is defined as the vertical overlap of the incisor teeth when the posterior teeth are in contact. Overbite is positive if the incisors overlap vertically, zero if they are edge to edge, and negative if they are vertically separated, i.e., negative overbite = openbite.

Procedure: The assessment of overbite is made on the upper right central incisor using the NIDR periodontal probe. If a measurement is 9 mm or greater, the call should be "A", "B", or "C" (A=10, B=11, C=12). If one or both of the right central incisors (upper or lower) are not fully erupted, missing, or fractured, substitute the left permanent central incisors. If even the left central incisors cannot be scored, no further substitution is possible, and a "Y" call is made. If, however, the teeth are rotated, take the measurement from the center of the teeth. Measurements are to be rounded down to the nearest whole millimeter.

The following paragraphs describe ways of recording three different kinds of overbite/overjet conditions that may exist in each subject's mouth. Only one of the three conditions will prevail in any one subject.

A. Positive Overbite. When a positive overbite exists, two measurements are made and their difference is overbite. First, with the teeth separated, the distance from the gingival margin of the lower incisor to its incisal edge is measured and the call, crown height = __ mm is made. If the CEJ is exposed, measure from the incisal edge to the CEJ. Second, with the subject's teeth together, measure from the same point on the gingival margin or the CEJ as before to the incisal edge of the upper central incisor and call this overlap = __ mm. The difference between these measurements (a - b) is overbite and is evaluated by computer.

B. Negative Overbite. If the overbite is so great that the upper incisor closes beyond the gingival margin of the lower incisor and it is totally covered with the posterior teeth together, two measurements are made. The first is the crown height of the lower incisor measured as above. The second measurement, overlap, is done as follows: With the teeth together, measure the amount of overlap of the gingival margin, or the CEJ as appropriate, by the upper incisor. The distance is obtained by laying the handle of the mouth mirror horizontally at the level of the incisal edge of the upper incisor and measuring the distance from the handle to the gingival margin of the lower incisor rounded down to the lower millimeter. The overbite will be the total of the first measurement (crown height) and the second one (overlap), and will again be calculated by the computer (a - (-b)). Call this overlap = negative __ mm.

C. Open Bite. If open bite is present, a single measurement is made. With the posterior teeth in occlusion, measure the vertical distance in millimeters from the edge of the lower central incisor to the edge of the upper central incisor and call open bite = __ mm.

Source: National Center for Health Statistics. National Health and Nutrition Examination Survey III, 1988-1994. Washington, DC: U.S. Government Printing Office.

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Turesky Index

Procedure & Method Information

Name of Procedure/Method Turesky Index

Abbreviation None

Purpose To assess the prevalence and severity of plaque build-up.

Year of Establishment 1970

Type of Procedure/Method

Developer(s) S. Turesky, N.D. Gilmore, and I. Glickman

Oral Condition Category

Background Information

Background Information

The Turesky Index, named for one of its developers, S. Turesky, was described in 1970 to assess the prevalence and severity of plaque build-up. It is the modified version of the plaque index originally developed by Quigley and Hein in 1962 to clearly distinguish the occurrence of mild plaque deposit build-up from moderate.

The Turesky Index, one of today's most commonly used indices in research, is considered to be a reliable index and a comprehensive evaluation method for anti-plaque procedures such as tooth brushing and flossing, as well as chemical anti-plaque agents (Fischman, 1986).

Changes Over Time None

Procedure Method

Procedure Method

To obtain the Turesky Index, the labial/buccal and lingual surfaces of all nonrestored teeth are examined and scored, except the third molars, for a maximum number of 28 teeth or 56 surfaces. A staining solution, basic fuchsin, is used to show plaque deposits. The examination scoring and criteria used to evaluate the presence and quantity of plaque are noted below:

Turesky Index - Scoring and Criteria

0 = No plaque.
1 = Separate flecks of plaque at the cervical margin of the tooth.
2 = A thin continuous band of plaque (up to 1 mm) at the cervical margin.
3 = A band of plaque wider than 1 mm but covering less than 1/3 of the crown of the tooth.
4 = Plaque covering at least 1/3 but less than 2/3 of the crown of the tooth.
5 = Plaque covering 2/3 or more of the crown of the tooth.

Source: Turesky S, Gilmore ND, Glickman I. Reduced plaque formation by the chloromethyl analogue of Victamine C. J Periodontol. 1970 Jan;41(1):41-3.

Afterwards, the scores for all the labial/buccal and lingual surfaces are summed for a total score. To calculate the Turesky Index, as illustrated in the following formula, the total score is divided by the number of surfaces examined. A score of 0 to 1 is interpreted as low, whereas a score of 2 or more is interpreted as high (Svirbely and Sriram, 1999).

Turesky Index = Total score/Number of surfaces examined

Established Modifications None

Federal Survey Modifications None

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Validaty

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Visual Analogue Scale

Procedure & Method Information

Name of Procedure/Method Visual Analogue Scale

Abbreviation VAS

Purpose To assess the intensity or severity of pain.

Year of Establishment N/A

Type of Procedure/Method

Developer(s) N/A

Oral Condition Category

Background Information

Background Information

The Visual Analogue Scale (VAS) is a type of scale that is commonly used in pain assessment. Other types of scales used to measure pain intensity are verbal numerical scales and word (i.e., categorical) scales. Examples of pain assessment instruments that utilized VASs are the Memorial Pain Assessment Card (MPAC) and the Edmonton Symptom Assessment System (ESAS).

Typically, as illustrated below, the VAS is a 10 centimeter (cm) linear horizontal scale or a graded horizontal scale with the left side indicating the lowest intensity (e.g., "No pain") and the right side indicating the highest degree of intensity (e.g., "Worst possible pain").

```
|____________________________________________|
No                                        Pain as bad
pain                                       as could
                                          possibly be

|_____|_____|_____|_____|_____|_____|_____|_____|_____|_____|
0     1     3     4     5     6     7     8     9     10
No                                                    Worst
pain                                                  possible
                                                       pain
```

However, VASs may be 10-cm linear vertical scales, curvilinear scales, or graded curvilinear scales of different lengths (e.g., 5, 10, 15, 20 cm) and with different end-phrases. Despite the different types and lengths of VASs, according to research, the graded 10-cm linear horizontal scale is more reliable, sensitive, and preferable (Seymour, 1982; Sriwatanakul, Kelvie, Lasagna, Calimlim, Weis, Mehta, 1983; Seymour, Simpson, Charlton, Phillips, 1985). In general, the VAS is simple and quick, easy to use, and has demonstrated good validity and reliability.

Changes Over Time None

Procedure Method

Procedure Method

For the VAS, the subject marks on the line the spot that represents the intensity of his/her pain. For very sick subjects, non-written versions can be used by having a health care professional run a pencil along the line while the subject indicates or confirms the point corresponding to his/her pain (Anaesthesiology and Intensive Care, The University of Queensland, 2001).

When measuring the subject's intensity pain, the VAS scores can be recorded as centimeters (i.e., 0-10) or millimeters (i.e., 0-100).

Established Modifications

None

Federal Survey Modifications

None

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Volpe-Manhold Index

Procedure & Method Information

Name of Procedure/Method Volpe-Manhold Index

Abbreviation VMI

Purpose To assess the presence and severity of calculus formation.

Year of Establishment 1962

Type of Procedure/Method

Developer(s) A.R. Volpe and J.H. Manhold

Oral Condition Category

Background Information

Background Information

In 1962, the Volpe-Manhold Index (VMI) was developed by A.R. Volpe and J.H. Manhold to assess the presence and severity of calculus formation, specifically new deposits of supragingival calculus, following an oral prophylaxis (i.e., dental cleaning) to remove all calculus present.

The VMI mainly has been used in United States in clinical trials to test agents for plaque control and calculus inhibition (Burt and Eklund, 1999). According to the literature, this index has demonstrated accuracy and good intra-examiner and inter-examiner reproducibility when the examiner is extensively trained by an experienced examiner and clearly comprehends and utilizes certain important fundamental principles (Volpe, Kupczak, and King, 1967; Volpe, Manhold, Hazen, Parker, and Adams, 1965).

The average time to conduct the VMI examination will vary according to the investigator's or examiner's working habits and experience, the amount of calculus present, and the cooperation from the patient. However, in general, a trained examiner can conduct the examination in about 5 to10 minutes (Volpe, Kupczak, and King, 1967).

Changes Over Time None

Procedure Method

Procedure Method

Before conducting the examination, it is essential that the periodontal probes be recalibrated by grinding the flat end of the probe while referencing an accurate millimeter gauge, such as the Boley gauge. The first increment should be grinded to 1.0 millimeter (mm) up to 5.0 mm using a green mounted stone or a triple-edged orthodontic file, if one wishes the millimeter markings be accentuated. The edges from the grinding can be made smooth by polishing them with a rubber disc. In addition, the probes may also be tape-colored to accentuate the millimeter increments.

After the subject has brushed their teeth, the first step of the exam is to thoroughly dry the teeth. This step is extremely important and is best accomplished by a portable air-compressor. Then, a saliva ejector is inserted into the subject's mouth to prolong the drying process by preventing the tongue from moistening the teeth during the measuring and recording. A second saliva ejector is also used in the traditional manner to absorb moisture from the oral cavity. For best results, it is recommended that an assistant be responsible for drying the teeth, therefore allowing the examiner only to score and record the calculus.

To obtain the VMI scores, the three tooth planes, the mesial, distal, and gingival, on the lingual surface of the lower six anterior teeth (i.e., centrals, laterals, and cuspids) are examined. The periodontal probe is used to measure the linear extent of the supragingival calculus by placing the flat calibrated end of the probe always at the most inferior visible border of the calculus formation. In cases where the gum tissue is unhealthy and displaced, the probe is used to depress the tissue to measure from the inferior border of the visible calculus. The calculus is measured in increments of 0.5 mm, from 0 to 5.0 mm. If a value of more than 5.0 mm of supragingival calculus is observed, it is so recorded. If no calculus is present, a score of 0 is recorded.

In special circumstances, when there is a thin, almost unmeasurable "collar" of calculus observed, resulting in all three measurements being less than 0.5 mm, the entire tooth is assigned a value of 0.5 mm. In cases where the interproximal area between two teeth is completely covered with calculus, one should draw an imaginary vertical line through the total amount of interproximal calculus present and assign one-half of the calculus to one tooth and the other half to the adjacent tooth.

To calculate the VMI score per tooth, the scores for the three planes, the mesial, distal, and gingival, are summed. Then, all the tooth scores are summed for the subject's total VMI score. The VMI is:

VMI = Total VMI score/Number of lower anterior teeth examined

Established Modifications

None

Federal Survey Modifications

None

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Xerostomia Inventory

Procedure & Method Information

Name of Procedure/Method Xerostomia Inventory

Abbreviation XI

Purpose To measure the signs and severity of xerostomia (i.e., dry mouth).

Year of Establishment 1999

Type of Procedure/Method

Developer(s) W.M. Thomson, J.M. Chalmers, A.J. Spencer, and S.M. Williams

Oral Condition Category

Background Information

Background Information

The Xerostomia Inventory (XI) was developed by W.M. Thomson, J.M. Chalmers, A.J. Spencer, and S.M. Williams and introduced in 1999 to assess the severity of symptoms related to xerostomia or dry mouth.

It is an 11-item instrument with a 5-point Likert-type scale (i.e., "never" [score = 1], "hardly ever" [score = 2], "occasionally" [score = 3], "fairly often" [score = 4], and "very often" [score = 5]) that incorporates both the experiential and behavioral dimensions of xerostomia (Thomson, Chalmers, Spencer, and Williams, 1999) and is considered to be a valid instrument for use in epidemiological and clinical studies (Thomson, Chalmers, Spencer, and Williams, 1999; Thomson and Williams, 2000).

Changes Over Time None

Procedure Method

Procedure Method

The XI is a self-administered inventory. After answering the XI, the response option scores are summed to compute the single XI scale score. Higher XI scores are equated with a greater severity of xerostomia symptoms.

Xerostomia Inventory

For each of the following questions, please respond: Never (score = 1), Hardly ever (score = 2), Occasionally (score = 3), Fairly often (score = 4), or Very often (score = 5).

1. I sip liquids to aid in swallowing food.
2. My mouth feels dry when eating a meal.
3. I get up at night to drink.

4. My mouth feels dry.
5. I have difficulty in eating dry foods.
6. I suck sweets or cough lollies to relieve dry mouth.
7. I have difficulties swallowing certain foods.
8. The skin of my face feels dry.
9. My eyes feel dry.
10. My lips feel dry.
11. The inside of my nose feels dry.

Source: Thomson WM, Williams SM. Further testing of the xerostomia inventory. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000 Jan;89(1):46-50.

Established Modifications None

Federal Survey Modifications None

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